# Marine Engineering and Shipping Age

**Volume XXVII** **February, 1922** **Number 2**

Published Monthly by
ALDRICH PUBLISHING COMPANY
In Conjunction With
SIMMONS-BOARDMAN PUBLISHING COMPANY
Woolworth Building, New York
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MARINE ENGINEERING is a member of the Associated Business Papers, Inc. (A. B. P.), National Association of Periodical Publishers, Inc., New York Business Publishers' Association and the Audit Bureau of Circulations (A. B. C.).

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## Motorships

THIS issue is devoted largely to motorships and Diesel engines because the developments in this department of marine propulsion are particularly significant at this time. Two large motorship passenger liners have just been completed for the British-African and British-Indian trade, two large motorship cargo vessels, the *Californian* and *Missourian,* are nearing completion in America and plans for several passenger, cargo and Government vessels to be equipped with Diesel engines have been prepared.

With the purpose of giving its readers complete information on these recent developments, MARINE ENGINEERING AND SHIPPING AGE has secured and reproduced in this issue at a large expense the drawings of the *Domala,* which is the first large vessel specially designed as a motor passenger ship; the drawings of the *Californian* and *Missourian,* which are the largest cargo vessels originally designed as motorships that have been constructed in an American yard: the drawings of the *Zoppot,* the largest motorship oil tanker, the drawings of several foreign and domestic motor towboats and an article by Commander S. M. Robinson on the Diesel electric motor drive. Complete information relating to the above mentioned vessels has not, to our knowledge, been published in any other American magazine.

## Does New York Really Want an American Merchant Marine?

WHILE the fact that most of the important newspapers of New York city are opposed to a subsidy in any form for our merchant marine does not necessarily mean that they are against American ships, yet the continual indulgence in destructive criticism of Governmental aid to shipping while remaining silent on the protection that is given to manufacturing and agriculture through the protective tariff and the absence of any practical constructive suggestions to take its place would indicate that the sentiment of the largest seaport in the country as far as shipping is concerned is distinctly the preservation of the "status quo."

The newspapers which are horrified at the suggested indirect tax on the American people of say 10 percent of the custom receipts, which would amount to about 30 cents per capita per annum, are not worrying at all about the loss to the country of several hundred million dollars in freight money. In fact they have suggested that the payment of this ship hire would be a possible solution of the settlement of the debts that are due us from foreign countries.

It is quite possible that the shipping nations could settle their obligations to us in a very short time were we to be foolish enough to depend on them for our ocean delivery wagons. Once assured that we are out of the shipping game, they would promptly charge us what they like and they would see to it that our goods were delivered not too soon after merchandise of a similar nature from their own country to in anywise embarrass its sale. In other words, it would become impossible to keep any trade secrets and the foreign merchants could not be blamed if they were to make use of the information gathered from their shipping organizations to anticipate our markets.

Again suppose an English ship were to be in New York harbor when it received simultaneous offers, one to take coal from Newport News to Buenos Aires at $5 a ton and another to take coal from Cardiff to the same port at $4 a ton. What would be the natural and, at the same time, patriotic thing for the owners of the ship to do? Would it not be to try and find a consignment to England, not only for the purpose of taking the coal from Cardiff but also so that more time would be available to secure a return cargo from Buenos Aires?

Then why are the newspapers of New York city against Governmental aid for our shipping on the one hand and jealous of the city's leading position as a shipping port on



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the other hand? Is it because the financial interests that dominate the shipping from our leading seaport are afraid that the development of an American merchant marine would create competitors in this and other ports and they are quite satisfied to leave well enough alone, or is it because they cannot see that a tariff on wheat or a manufactured article is the same kind of protection that they are so horrified at seeing extended to shipping?

## Thirty-three Knot Passenger Liners

THE proposal to complete certain of our scrapped battle cruisers for the Atlantic passenger service seems to have aroused the British interests, there having appeared in print several statements relative to the projected construction by the British with Governmental aid of a fleet of fast liners, capable of making the transatlantic run from Ambrose Lightship to Lands End in three days. Such vessels are probably practicable from an engineering standpoint. They could accommodate a large number of passengers. They would have a certain advertising value. Nevertheless to put them into service and to maintain anything like the schedule suggested would involve an enormous expenditure, even for a strong Government. The following considerations will, it is thought, lend force to this statement:

Assume a vessel of the following characteristics: Length, 1,000 feet; beam, 105 feet; draft, 38 feet; displacement, 65,000 tons; longitudinal coefficient, 0.58. At 36 knots such a ship would require about 280,000 shaft horsepower and at 33 knots (the speed suggested) about 190,000.

Assume that this ship covers a distance of about 6,300 nautical miles per round trip at a fuel consumption (while at sea only) of 1.1 pounds of oil per shaft horsepower hour. The oil fuel burned per round trip would be nearly 18,000 tons. The cost of oil in such quantities would seem almost prohibitive. It would be hardly possible to carry this amount in the ship's bunkers at one time so the vessel would have to fuel at both ends of her trip.

It is also probable that present day merchant practice with regard to the duty of marine boilers would have to be modified in the case in hand in favor of higher pressures in order to get the steaming capacity required into the ship.

Again it would probably be necessary to resort to 6 screws at a somewhat decreased efficiency compared with the 4 screw installations, with which we are familiar, in order to keep the power per shaft within reasonable limits.

The disposal of the waste gases from a boiler installation of such size is no small problem, particularly when interference with valuable passenger carrying space is considered.

The design of a hull of the size and type suggested which would have the requisite local and girder strength is a serious undertaking.

The foregoing problems, though presenting real difficulty, can doubtless be solved by the designer of today. It may be open to serious question, however, whether it is practicable to drive such a vessel with regularity under ordinary weather conditions in the North Atlantic at speeds approaching 33 knots without excessive damage to upper works and consequent undue expense and possible risk of life.

When it is considered that about 90,000 shaft horsepower for the battle cruisers and about 100,000 shaft horsepower for the vessels having the dimensions noted above would insure a service speed of 25 or 25½ knots and that such a machinery installation would simplify design and construction and greatly reduce the first cost and cost of operation, it appears that the price that would have to be paid for the high speed proposed is prohibitive. But it also shows that the conversion of the battle cruisers into passenger ships, which from an engineering standpoint can be easily accomplished, according to the views of some of our foremost naval architects, is by no means so impracticable from a business standpoint as some people would like to have us believe.

Whether or not the proposal to construct these fast liners is a result of the possibility of the conversion of our own battle cruisers into passenger ships, it shows that the British are well aware of the value of this type of vessel for both war and commercial purposes. No comparison of the naval strength of two countries that does not include the convertible merchant tonnage is correct and, if our statesmen overlook this fact, we may be sure that those of other countries will not.

## Shipowners Must Do Their Part

NOW that Congress is to be asked to pass a subsidy bill, it is incumbent on the shipowners themselves to practice the strictest economy in the operation of their vessels. Great strides in this direction have been made by several concerns along the lines of reduced personnel and office expenses, lower manning scales on their ships and the reduction of crews' wages and subsistence allowances.

There remains, however, much that can be accomplished by the economical use of fuel. We assume that very careful consideration will be given to the machinery installations of prospective ships but are there not opportunities to increase the efficiency of a large number of our existing vessels?

In this connection, we note in the annual review number of the Liverpool *Journal of Commerce* that "superheaters for marine boilers are now becoming the rule rather than the exception." If English shipowners reduce their fuel bills by using superheaters and many of our shipowners do not, an opening is furnished for those who oppose subsidies to ask an embarrassing question.

In a like manner, anyone who has witnessed the amount of soot escaping from the stack when soot blowers are in operation cannot fail to be impressed with the possibilities that this equipment offers for saving fuel. There is no material that ranks higher as a non-conductor of heat than soot. Are your boilers fitted with this device?

Space does not permit a discussion of bunkering schedules, care of fires or the economical use of steam after it is generated. It is well known, however, that all these departments offer excellent opportunities to make a real saving in the cost of operating a ship. Our readers' attention is invited to an address by Mr. R. H. M. Robinson appearing on page 85 and an article by Mr. R. E. Annin published on page 83 of this issue. We shall not deserve a subsidy unless every effort is made to reduce operating costs to a minimum.

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## Governmental Aid

CALL it by whatever name you please, a subsidy of some form or another must be granted to American ships or our merchant marine will disappear from the seas. On this question practically all marine authorities agree, qualified, of course, by the reservation that the amount of the subsidy should not be in excess of that which is necessary to maintain in successful operation only those vessels that are of desirable design and efficiently managed.

A good and sufficient argument for the prompt passage of the Governmental aid that the President will shortly ask Congress to give our merchant marine, and which did not exist at the time the Gallinger subsidy bill was defeated by three votes in the House, is the fact that the Government will be able to save many millions of dollars by granting a subsidy that will make it possible to dispose of the Shipping Board vessels to private owners.

Not only is there no chance to interest private capital in the Government-owned vessels, 1,000 of which are now tied up, without some assurance that shipping as well as other industries will receive some form of protection, but there is also no other method by which the enormous drain on the public treasury which is caused by the care and upkeep of these tied-up vessels can be so efficiently stopped.

Having Chairman Lasker's figures, which were recently given to the Committee on Appropriations, to the effect that only one of the four millions that at present constitute the monthly loss of the Shipping Board is going for actual operations, the so-called "Watch Dogs of the Treasury" will think twice before they vote against a bill that is the only hope of getting the Government out of the shipping business.

## The Next Marine Exposition

THE American Marine Association, formerly the Marine Equipment Association of America, has secured the Grand Central Palace for the next annual marine exposition, which will be held during the week of November 6. Although the first exposition was held at a time of severe business depression, it was an unqualified success, which was due in a large measure to the splendid cooperation given by the practical and technical marine associations and societies.

The Society of Naval Architects and Marine Engineers has decided to again cooperate in the coming exposition by changing the date of its annual convention from the week of November 13 to the week of November 6, thus securing the opportunity for its members to inspect the new developments in the marine field relating to their profession.

Influential members of other marine associations are known to favor holding their conventions during the week of the exposition.

The American Marine Association, in addition to sponsoring the annual marine show in New York, will function during the year as a Chamber of Commerce in the marine field, thus enlarging its scope to include any legitimate opportunity to aid in the development of an adequate American merchant marine.

# The President's Shipping Plan Will Succeed

### Watchdogs of the Treasury Know That the Nation Will Save Millions of Dollars by Protecting Our Merchant Marine

**By "Old Scotch"**

AT this writing plans for a comprehensive system of aiding the American merchant marine are rapidly taking form. Lines are already becoming drawn as to the attitude individuals, associations and the public press will take in the approaching contest before Congress. As the action of that body is largely guided by public opinion, especially on the eve of an approaching election, it is well for those of us vitally interested in the subject, and that includes everyone directly or indirectly connected with the shipping industry, to look about and see what the future portends.

Already the writer has heard quite a number of men prominent in the industry express grave apprehension of the outcome, their fears being based on the failure of past attempts and what they consider the widespread disapprobation of the public concerning the aiding of any one industry at the expense of the general Government.

#### Attitude of the General Public Favorable

The writer has as wide an acquaintance among people generally as the average man, and perhaps more. Thus far he is happy to state that this feeling of apprehension seems to be confined to those in the industry. It has been most pleasing to him to note the almost general approval of the scheme among the laymen with whom he has discussed the general subject. Such expressions as, "Why, of course, we must subsidize our merchant marine: we cannot expect Americans to go to sea for the same rate of wages paid to foreigners." "What is the use of temporizing with the subject: we must have a merchant marine and we are willing to pay for it," are quite frequent among people who have no direct connection with shipping whatsoever.

The writer talks merchant marine and subsidy on every occasion which presents itself, and to all classes with whom he comes in contact. Having a very good recollection of the two previous attempts to enact legislation for direct aid to our shipping, he has reached the conclusion at this stage of the present agitation that a marked change has come over the public generally in its attitude towards and its knowledge of shipping. He therefore wants to go on record in predicting that whatever relief President Harding may see fit to recommend for our shipping in the foreign trade, the measure will be enacted by Congress without any great opposition. In support of this prediction the following reasons are submitted.

#### Why Congress Will Aid Shipping

At the time the last subsidy measure was before Congress, it is estimated that there was not more than two hundred millions of dollars invested in ships capable of engaging in overseas trade. The people of the South and Middle West were not in the least interested in shipping, and were almost unanimously arrayed against the principle of what they

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termed special privilege to any industry. English and German steamship interests, fearing the loss of trade on the ocean, waged a vicious propaganda against the proposed legislation, which was very easily swallowed by people in the Middle West, who then had not become educated to the national value of shipping and who, in common with the rest of us gullible Americans at that time, had not learned to discern foreign propaganda in our daily press, thinly guised as it was then put up to us. Our export trade in manufactured goods was very small in volume, the products of the soil and mines sent abroad then predominated to a marked degree.

Despite this comparative lack of interest and of powerful backing in any particular line, the so-called Gallinger-Frye bill passed the Senate by a very substantial majority and only failed of passage in the House of Representatives by one or two votes. A dissension among the Republican members from Illinois was really the cause of failure. Strange as it may seem some of the strongest and most intelligent backing for this bill came from the states of Ohio, Indiana and Illinois. No one of these three states could by any manner of means be accused of having direct interest in maintaining American ships in the foreign trade. The underlying motive of the supporters of this measure, who lived in these states, was vision and broad-minded statesmanship. "Uncle Joe" Cannon, still in Congress at eighty-five years of age, was one of the warmest supporters of the measure.

Let us now take stock of the changed conditions which will exert influence on the passage of the next bill.

### Our Need for Ships and Shipping Universally Recognized

Basically we have changed our economic conditions so that now our manufacturing interests exceed our agricultural and mining efforts. We have not less than 15 percent of surplus products which must be sold abroad, in competition with other producers which have their own ships to deliver their goods in these competitive markets. It needs no complex argument to convince even a schoolboy that no concern can sell its goods in competition without having its own delivery system. That fact is pretty thoroughly grounded in the minds of all American citizens.

Before we entered the great war there was an insistent demand for the products of the American farms and factories throughout all Europe. We had the orders and the goods to fill them but, along in 1914 and 1915, it suddenly dawned on our exporters that we did not have the ships in which to deliver them. Germany's entire merchant marine had disappeared from the seas. England's cargo ships, as well as those of many of the neutrals, were being ruthlessly "strafed" by the relentless German U-boats. Our wharves and freight yards at the leading American seaports were rapidly congested and all of us along the seaboard became familiar with stacks of machinery and manufactured goods dumped along the railroads, sometimes three or four miles away from the wharves, because there were not sufficient ships to carry the goods to suffering Europe. The farmer and manufacturer in the interior were acutely aware of the lack of shipping facilities, when their bankers could not advance them money on undelivered goods. All of this has sunk deeply in the minds of the people, and shipping is now throughout the length and breadth of our land viewed much more intelligently than ever before.

Another factor, also a heritage of the war, must be taken into account and that is that the three million and over of the picked young men of America, the very flower of our country, have made at least two ocean voyages on their way to and from the battlefields of France. The majority of these had to travel under foreign flags, owing to an insufficient number of American ships. However, the main point to them and to the country is that they now have an intelligent idea of ships and the ocean. Every city, town and hamlet throughout the land now contains among the population at least one or more intelligent young men who can speak knowingly of the value of ships and discourse to their associates on their experiences at sea. Ships and shipping are no longer enigmas to the ranchmen of Wyoming, the cotton planter of Texas or the farmers of Kansas and Nebraska.

### Shall We Scrap the Billions of Dollars We Have Invested in Ships?

Viewed from an investment standpoint how vastly different are the conditions now? Within the past five years it is conservatively estimated that not less than five billions of dollars of our national wealth has been invested from public and private funds in ships and shipbuilding facilities. They are not worth that much today and, if legislation is not enacted to make their operation profitable, this vast sum may as well be wiped off our ledgers. But "money talks" because of the thousands of men to whom capital gives employment to make it talkative, and it is not conceivable that people who are as shrewd in money matters as we are reputed to be will supinely lie down and see this tremendous amount of our savings entirely dissipated for the lack of a little intelligent legislation to rescue it from the scrap heap.

Viewed from a political standpoint, and everything we do as a nation has more or less politics in it, the outlook is very encouraging. Previous attempts at subsidy legislation were fought out along party lines, the Republicans favoring it and the Democrats opposed. Now it is entirely different, as party lines have disappeared. Some of the ablest proponents of all beneficial legislation are Democrats. The South is as deeply interested in shipping as are the East and West. The great Mississippi Valley, the very heart of the country, now realizes that we must have our own ships to market their products, as never before. President Harding, always a staunch believer in and a supporter of our merchant marine, deems the matter of such transcendent importance that he will appear personally before Congress and urge the passage of the legislation he deems necessary. He will not do this for party politics, but in the best interests of the nation.

### Both Political Parties Pledged to Support the Merchant Marine

It must be remembered that the platforms of both the great political parties contain planks pledging each to the support and building up of our merchant marine. That is one subject upon which we, as a nation, have had but very few differences of opinion. The doctrine was first strongly enunciated by Thomas Jefferson and throughout our national history has been endorsed by the great men of both parties. What other one national policy could enlist the modern day support of such leaders as Wilson, McAdoo, Underwood, Harding, McKinley, Cannon and Jones?

They may differ as to the exact means of affording encouragement to our shipping but all recognize that whatever means are necessary must be employed. There now seems but little doubt that President Harding will present a plan for aid which both parties can get behind and push to success.

It must be done, and what *must* be done *will* be done.

This subject is so much the question of the hour for all persons interested in shipbuilding and shipping generally, that all other matters are secondary. We must therefore all of us devote our time and energy to its accomplishment. Never take it for granted that you are going to win, just have faith that you must win, but never relax in your efforts to assure success. Each reader can help the cause in some way. Convince your neighbors that it is the right thing to do, and write to your senators and congressmen that you expect them to vote for it.

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# Features of the New Shipping Bill

## Sale of Government Fleet, Revolving Loan Fund, Income Tax Reductions, Marine Insurance, Immigration, Revision of Navigation Laws, Naval Reserve and Subsidy

By Winthrop L. Marvin*

WHEN President Harding and Chairman Lasker formally launch their shipping bill, they will present a measure of broader scope than has ever been attempted in this country. It will inevitably be known colloquially as the subsidy bill—even Senator Underwood's preferential duty plan of 1913 was so styled while it was under debate in Congress. But the new measure will undoubtedly contain far more than actual subsidy propositions. A long array of important forms of indirect assistance to shipbuilding and navigation has been commended to the Board, of which the first and the most indispensable of all is the sale of the Government-owned fleet "as rapidly as possible, at prices not to exceed the prevailing world market prices for similar tonnage." Already has the Shipping Board begun to function in this direction in the disposal of the *Tuckahoe* and *Absecon*—enabling American shipowners for the first time in a great many years to start with their capital cost on an equality with that of their foreign competitors.

Just how essential this even start is can readily be shown by a comparison based on previous and present figures. The *Tuckahoe* and *Absecon* were of a class once held at about $175 a ton, or a total price of about $900,000. At this staggering figure the annual charges for interest, insurance and depreciation on such steamers would have amounted to $117,000. Assuming that the price at which the ships were lately sold is in the vicinity of $35 a ton, these fixed charges, based on a total cost of $178,500, would be $23,205 a year.

### Fixed Charges

The former capital cost would have made competition and success absolutely impossible. The present price makes success a probability. With equality in capital costs between American and foreign ships, all that remains to be covered is the higher wage and subsistence cost of American vessels, amounting in the case of such ships as the two under consideration to less than a thousand dollars a month, or $12,000 a year. This is a subsidy which seems easy and practicable. It is a small price for the American nation to pay for the service of an efficient unit of a great merchant marine.

### Revolving Loan Fund

Another recommendation which the Administration, the Shipping Board and the leaders of Congress will consider in the making up of an adequate bill is a proposal for a revolving merchant marine loan fund of $100,000,000, to be applied especially to encourage the construction of liners and other special types of ships in which the American merchant service is today deficient. It is assumed, and it ought to be possible, when this fund is once secured, out of proceeds of the sale of Government-owned ships or if necessary by a bond issue, that the fund, properly handled at a fair rate of interest, would reproduce itself year after year so that no further additions to it would be necessary. Many nations have tried this plan of loans on sound business principles to encourage shipping. There is no reason why it should not succeed in our case as it has in others. For the construction of a new ship the Government loan would be one-third of the capital required, the two-thirds to embody the investment of private capital.

### Income Tax Deductions

An entirely new feature in American maritime policy would be a deduction from net Federal income tax, payable by shippers or travelers, of a certain percentage of the freight moneys on either exports or imports and on passenger fares in American ships. This is an expedient of unexplored possibilities. It will certainly create a strong, constant preference for the American flag on the part of exporters, importers and travelers. It is a substitute for Section 34, subject to none of the objections of the other plan and not forbidden in any way by treaty stipulations. It is an indirect aid, but one likely to prove exceedingly potent—something which observers will watch with steadily increasing interest.

Our principal maritime competitors have dealt liberally with their shipping in the matter of depreciation since the great war. These nations have recognized the fact that actual depreciation has been abnormal and they have allowed their shipowners to work down their valuations to a point conformable to the depreciation that has actually occurred, thus placing their shipping on a conservative basis and relieving it of inordinate taxation. This is a problem of the Treasury Department, but it can be greatly facilitated by constructive legislation.

### Marine Insurance

Powerful marine insurance facilities are an essential part of the development of an American merchant marine. The Shipping Board tonnage has been grievously discriminated against by underwriters, sometimes in this country and more insistently abroad. The temper of the Shipping Board is to meet this issue boldly so far as Government-owned tonnage is concerned. But it is important to remember in whatever is done in this direction that the Government must avoid any actual competition with established marine insurance facilities of the United States. The popular demand to take the Government out of business and keep it out is strong not only in the operation of the ships but in their insurance.

### Immigration for American Ships

One-half of our immigration for American ships is an expedient which should appeal as just to the country, which realizes that the immigrant business is the most profitable of all. Particularly, at existing immigrant passenger rates, control of 50 percent of our immigration in American ships will do even more than direct subsidy to strengthen transatlantic liner services under the American flag. If our Government has a right to prescribe that immigration shall be limited annually to 3 percent of the immigrants of each race already in the United States, it has the right to insist that one-half of the immigrants admitted shall come in American vessels.

It is worth observing that Italy requires that none of her people shall leave Italian ports in any other than National steamers. Once adopted, this reservation of 50 percent of the immigrants to American liners will undeniably become the unchanging policy of our Government. It will help mightily

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to create the large, fast steamers of prime value to the National naval reserve. A very important practical advantage is that opportunities for inspection and examination will be possible on these American controlled vessels before they arrive and that generally the immigration laws can be enforced in ways not possible on ships of alien nationality.

### REVISION OF NAVIGATION LAWS

No general shipping measure would be adequate which did not involve a careful revision of the navigation laws and rules of the United States. For two years the Shipping Board has had the formal findings of an expert committee on this subject. As a part of a new shipping bill, or simultaneously with it, the La Follette seamen's law and other navigation laws in general should be amended in the light of the needs and principles of today. This need involve no antagonism to labor—for hereafter the labor on American ships is destined to be American and, therefore, not of a kind that instinctively assumes that capital is its deadly enemy

### NAVAL RESERVE

A popular feature of any shipping legislation will be the granting of substantial retainers to citizen officers and men of the naval reserve. Nothing will do more to increase the pride of calling of the personnel than a formal recognition of the National need of the officers and crews of the merchant service as especially valuable defenders of the country in a National emergency. Naval reserve ships flying a distinctive flag and officered and manned from the naval reserve enrollment will be a National recognition of the peculiar value of a trained and loyal seagoing personnel. It is true that the old "international" seamen's unions, composed chiefly of aliens, will fight this policy as they have always fought it, but it is full time that these sinister organizations were wholly and forever eliminated from the new merchant marine.

### SUBSIDY FOR OVERSEAS SHIPPING

Indirect aids like most or all of the foregoing can be utilized in part to cover whatever higher cost of construction there may be for the new liners and for special types of ships that may have to be added for the purpose of creating a thoroughly symmetrical fleet, in addition to the war-built cargo steamers. But these indirect aids themselves will not suffice. There is undoubted need of direct aid by subsidy also. Those who have given counsel to the Shipping Board on this point have urged that the subsidy to cargo ships and to the faster liners altogether should ultimately be limited to about $30,000,000 a year, or one-tenth of the anticipated revenue from customs. It is an expert estimate that such a subsidy expenditure would cover a very large complete fleet of overseas shipping of about 7,500,000 tons gross register, capable of carrying between 50 and 60 percent of the whole seaborne commerce of America. This subsidy would be paid to privately-owned ships and to Government-owned ships as fast as they are transferred to private capital and enterprise. This would produce a powerful incentive for the purchase of the Government-owned tonnage by equalizing competition with foreign ships and making it possible to operate tonnage under the American flag in world commerce.

An expenditure of $30,000,000 a year is greater than was contemplated in the Frye-Hanna bill of 1901 or the Gallinger bill of 1905, but it must be remembered that it is applicable to a far greater merchant marine, most of which is already in existence.

### AN ADMINISTRATION MEASURE

These are all well-considered recommendations. The shipping bill itself will be framed jointly by the Shipping Board and by the leaders of the Senate Committee on Commerce and the House Committee on Merchant Marine and Fisheries. It will not be a mere Shipping Board bill, but a distinctive Administration measure. Unlike any previous efforts this new bill is justifiable on the strong ground that it involves a reduction and not an increase of expenditures. Continued maintenance of the great organization of the Shipping Board and of the Emergency Fleet Corporation, and assumption by the Government of the losses of the operating lines and of the tremendous cost of depreciation of a thousand ships laid up, are heavier drafts upon the National treasury by several times than the entire cost of subsidy disbursements. As Chairman Lasker has again and again declared, Government operation of shipping, even by experienced and able men, is inevitably costlier than private operation, where operators have the incentive of gain and must earn a profit to secure a livelihood.

### PROPOSED LEGISLATION WILL SAVE MILLIONS

It will be demonstrated again and again to Congress in the course of the debate upon the proposed legislation that the Government will save millions of dollars a year for many years by turning the workable Government fleet over to private hands and protecting private owners and operators sufficiently to meet the competition of the lower wages and subsistence, and, in addition, of the State aid of Europe and Japan. There can, therefore, be no pretense on the part of self-appointed watch dogs of the treasury that the interests of economy demand the neglect and destruction of the new merchant marine.

The whole country is weary of Government experimentation in the shipping business. Liquidation of all the vast war-time accumulation of supplies and materials is rapidly going on and will soon be ended. Only the ships remain, and their sale also is imperatively demanded by popular opinion. The issue cannot be dodged; it cannot be ignored. The fact that the Government-built fleet is still on Government hands will keep the question of National policy for the merchant marine constantly before Congress and the country. In the recommendations presented, the President and the Shipping Board have the material for the strongest shipping bill ever written by any men in any nation and they have the spur of economy and retrenchment driving it on.

### URGENT REASONS FOR SUBSIDY

If the Government is ever going to realize any fraction of the three and one-half billion dollars which the great war forced it to devote to the building of a merchant marine it must be by the sale of the better portion of the war-built fleet to men who best know how to operate these ships under conditions that will afford a living profit. No subsidy proposal has ever come before Congress with any such chance and any such urgency as this. And it is to be remembered that previous shipping bills were beaten only by desperate hyphenate opposition through a nation-wide Teuton propaganda. Moreover, friends of the American ships were then defeated only by a scant majority of from two to eight or ten in the House of Representatives.

Most encouraging is the active, organized movement of American men of business in the Middle West to impress the need of a vigorous American merchant marine upon their public men in Washington. There ought to be a similar movement among the American farmers of the Middle West, who were the heaviest sufferers when in 1914-1915, because of a lack of American shipping, the cost of transporting a bushel of wheat across the Atlantic actually amounted to a greater sum than the farmers themselves received for all the labor and expense of producing that bushel of wheat!

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FRENCH TANK STEAMERS.—France has in service an oil carrying fleet of 41,000 tons carrying capacity. Seventeen tankers, aggregating 159,000 tons, are now under construction in France, most of which will be completed by January, 1923.

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# Shipping Affairs Progressing Rapidly at Capital

## Committee Recommends Appropriation for Shipping Board—Chairman Lasker Prophesies This to Be Last Request to Congress

**By Harold F. Lane**

THE House Committee on Appropriations on January 18 favorably reported the bill providing for the appropriations asked by the Shipping Board and the Emergency Fleet Corporation for the fiscal year 1922-1923. The appropriations requested are $50,000,000 for fleet operations and $50,000,000 for the settlement of claims, of which $30,000,000 is to be immediately available. The bill also provides for continuing the appropriation of March 4, 1921, of $55,000,000 which is to be made available to the Board from the proceeds of the sale of its assets, so that the balance of that amount may be used in its operations during the coming year. For the Shipping Board itself $459,000 was recommended.

In this connection Chairman Lasker of the Shipping Board made a statement, saying that he viewed the action of the committee as a vote of confidence in the Shipping Board. He predicted that if world shipping conditions improve and Congress provides for a ship subsidy which will make it possible to sell the ships now owned this will be the last appropriation of any extent it will be necessary for the Board to ask. He said that he had not wished to make any formal statement of what had been accomplished by the new Shipping Board until it had first formally submitted all the facts to Congress. This opportunity was presented in the hearings before a subcommittee of the appropriations committee just concluded.

### Indicates Reestablished Confidence

"When the present board took office," Mr. Lasker said, "the temper of Congress as evidenced in the discussions of the deficiency bill for the Shipping Board was one of lack of confidence in the enterprise and a virtual verdict that the administration of its affairs under me was on trial. In effect Congress said it wanted to be shown. After taking evidence during the past two weeks—over 400 printed pages—in what the subcommittee of the House Committee on Appropriations termed one of the most illuminating and complete hearings ever held before it as to any governmental department, and after investigating in the minutest detail every item of operation, organization and finance, the subcommittee reported favorably to the full committee, and the full committee reported favorably to the House on every request that the Shipping Board made for appropriations for the coming year. This to our mind constitutes more than a mere vote of appropriation. The subcommittee, with a thoroughness that could not be exceeded, explored every bit of work and every important transaction in which the Shipping Board is engaged and its vote to grant the appropriation to our minds constitutes a vote of confidence that inspires us to carry on the important work in which we are engaged.

"We come before Congress showing the Emergency Fleet Corporation for the first time organized as a private corporation, managed by technical men, positioned to compete with private enterprises of a similar nature in so far as that is possible under the handicap of Government ownership. We have erected in the Fleet Corporation an organization that is daily cutting out waste and chicane, and bringing into being orderly processes and improved service that should win back the confidence of the shippers. In this time of depressed world carrying trade practically all steamship companies except those exclusively in the North Atlantic passenger service are losing large sums of money. In proportion to its operations the Fleet Corporation loss is down to a minimum.

### Voyage Operating Loss Less Than Million a Month

"With almost 400 ships on the seas the monthly voyage operating loss is less than a million dollars. The balance of the $4,000,000 a month which the Fleet Corporation is requiring at the present time is devoted to repairs and betterments, insurance, cost of lay-ups and administration expense. The slightest upturn in world shipping will immediately result in the voyage operations showing a profit and with an appropriation for the settlement of claims, then, when these are disposed of, a large share of the administrative expense can be done away with. The 400 ships now operating cover practically every port in the world, insuring to the American shipper delivery under the American flag wherever he wills. By proper management in Washington we have improved the service of our operators. We have reduced our payroll from practically $16,000,000 to less than $11,000,000 and at the same time immeasurably improved the character of our executive personnel. We have for the first time in the history of the Board an inventory of its assets and a statement of its assets and liabilities.

### Probably Last Request

"With the appropriation asked, by the end of this calendar year the Shipping Board should be free of all debts current and claims and have only outstanding such judgments as may accrue from cases in court. With any upturn in world business the loss should cease, so it is fair to prognosticate that this, the first annual appropriation asked by the present Shipping Board will very likely be the last. If world conditions do not improve and if there is no Government aid to American shipping a slight appropriation may be needed for the maintenance of trade routes in the fiscal years 1923 and 1924 but, by and large, I feel I can verily announce to the country that the end is here of appropriations for the country's great ship enterprise.

"The record made has shown that the Shipping Board has taken the mysteries out of the history of the Shipping Board and in it its readers can find, revealed in every detail, the history of the board from its inception to the present time. We feel pardonable pride in congratulating the country and ourselves that in seven months we can say that, by and large, this is the last loss to any extent, save in the settlement of lawsuits, that the Shipping Board will be to the country. It feels good to make this announcement of an enterprise that has taken $3,300,000,000 of the country's money and to be able to say that after this no more will be needed.

"After the President makes his suggestions to Congress and if Congress should grant Government aid to private shipping we feel that we can liquidate the immense tonnage owned by the Board and that liquidation will bring back to the Treasury much more than the cost of a subsidy. If this happens, within two years I hope and believe that we will be out of Government operation and that the Shipping Board in the liquidation of its assets can be a source of income and not an expense."

### Ship Subsidy Plan Soon to Be Announced

The Shipping Board's report containing recommendations on plans for a ship subsidy, the result of its study of various



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reports submitted to it by a committee of experts and by the various interests concerned, is about ready to be submitted to the President, who will shortly thereafter go before Congress to urge the enactment of the legislation to carry out the plan finally decided upon. Various predictions are made as to the prospects of getting a bill through Congress and it is certain that a lively fight will ensue before the question is settled. Chairman Lasker of the Shipping Board has been making a number of speeches in various parts of the country in an effort to win public support for the subsidy idea, saying he sees no hope for the future of the American merchant marine unless a subsidy in some form is provided to aid it and that whatever it costs will be more than repaid by making it possible for the board to sell the Government-owned ships to private operators and for the Government to get out of the business of ship operation.

### Flexibility Desired

Whatever plan is decided upon, the Shipping Board is anxious to have enough flexibility to the subsidy plan so that it may not be at once made ineffective by the action of some other country in increasing its subsidy to its own ships. For the same reason it is desired that Section 34 of the Jones law be retained upon the statute books where it could be used if necessary.

A draft of a preliminary report of an advisory committee of experts making recommendations to the Board was published in a number of newspapers shortly before the end of the year as representing the administration plan, but Mr. Lasker issued a statement pointing out that this was but one of several reports to be made and that the Board certainly would not approve some of the recommendations there made. The details of the Shipping Bill that the President will ask Congress to enact are outlined as nearly as can be estimated at this time on page 79 of this issue.

### Proposed Form of Direct Aid

With regard to the forms of direct aid—a differential payment to American ships based on their higher wage and subsistence cost, and postal subvention to regular services—the funds to be raised by the reserving of one-tenth of the customs receipts and of the increased tonnage taxes—the American Merchant Marine Joint Committee heartily approves the recommendations that have been made to the Board. Of the three proposed plans for granting the differential payment it recommended that "whatever legislation is passed through Congress should be based on the principle of the Gallinger plan of so much per gross ton per year—the faster passenger ships to be encouraged by means of the postal subvention."

The American Merchant Marine Joint Committee believes that the legislation recommended should set forth the general principles upon which the subsidy should be granted as outlined above and that the Shipping Board should be given authority to carry out the details in accordance with those general principles.

In addition to the foregoing it was urged and recommended "that the United States Shipping Board devise some plan of equitable adjustment of the prices for the American shipowners who have purchased vessels from the United States Shipping Board and paid for same either in full or in part."

### Concerning Section 34

Homer Ferguson, president of the Council of American Shipbuilders, also submitted a report on the attitude of the council toward maritime legislation, in which the council asserts its continued attachment to the legislation contained in the merchant marine act of 1920. The report said the council is opposed to the repeal of Section 28, Section 34, or of any other section of the merchant marine act which has not hitherto been put into effective operation, on the ground that "the fact that reasons of state may have hitherto prevented the enforcement of these sections, and that such reasons still exist, is no just ground for the repeal of either. They should remain upon the statute books to be instantly available when the state reasons of today give place to the state reasons of tomorrow. It may transpire that other proposed measures in aid of the merchant marine will fail of enactment, or if enacted, may prove ineffective, and if effective, may be of short life. In either of these events the existing sections would prove invaluable."

The report continued in part: "The council believes that the declaration of the merchant marine act, that the purpose of its enactment was to secure to American vessels the carriage of the greater portion of our own commerce, expressed an aspiration so just as to disarm criticism. It believes that the first step towards the accomplishment of this result is to economically exclude from our trade with all nations all ships except our own and those of the other party to the trade. Commerce between nations includes carriage. Nations stranger to the commerce should not be permitted to intrude their ships therein.

"The merchant marine act is a Congressional recognition that the American ship can not take or maintain its place upon the sea, except by effective discriminations in its favor.

### Agreement on Form of Subvention Sought

"If reasons exist which at present prevent the discrimination from taking the form of preferential duties, then the less preferable form of discrimination, namely subsidy, must be enacted in the meantime unless Congress is prepared to sacrifice the substance to the form.

"This council does not favor subsidy as an alternative policy to that of the merchant marine act, or as in anywise a substitute therefor, but as a measure of relief until events permit discriminations better suited to the genius of the American people.

"This council recognizes that hitherto measures beneficial to the merchant marine have for many years been defeated by dividing the friends of the merchant marine into hostile camps, each so opposed to the relief proposed by the other, that a cause dear to both has been lost. Those who have favored subsidy have opposed discriminating duties and those who have favored discriminating duties have opposed subsidy, with the natural consequence. Repetition of such a conflict may be expected to produce a repetition of result.

"This council believes that any subsidy measure passed at this time should (a) either avoid appropriation, or if this is necessary, promise continuance; (b) it should be confined to present American vessels of approved class, or to vessels hereafter American built: (c) it should not be of a character to encourage bad ships to remain in the trade; (d) it should provide that vessels hereafter sold by the Shipping Board should carry subsidy or not, as might be provided in the sale.

"In the event that foreign objections are not controlling, it would be desirable that the measure should devote a certain fund to the subsidy, which would not require continual reference in the appropriation bill, thus eliminating the measure from the arena of politics."

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**Pacific Coast Pool Proposed.**—President Harding and the Shipping Board have given their approval of a plan proposed by Pacific Coast interests to form a large company to buy Government vessels in operation from Pacific coast ports, the stock to be distributed as widely as possible among the people of the Pacific coast states. Plans for the creation of a $30,000,000 shipping company on the Pacific Coast will be discussed in Washington early this month, when Chairman Lasker of the Shipping Board will call a conference of the Western interests to consider means of promoting the pool.

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# Economical Steamship Operation and Management

## Bunkers Provide Field Where Most Telling Economies Can Be Practiced—Choice of Ship and Fuel Very Important

**By Robert E. Annin**

ONE of the most obvious and exacting requirements of successful management is the noting and interpretation of current events and symptoms in all fields, both in relation to present action and to the formulation of the broader and more stable policies which must be framed to meet the probable needs and eventualities of the future. As the present situation clarifies with the passage of time, the market itself is seen to be running very true to form. On the one hand there is an occasional steadying of rates, with slight advance for some trades, which is the natural and predicted result of the voluntary reduction of active tonnage. On the other, it is notable that such demand as exists is almost entirely confined to nearby tonnage, which indicates, on the part of shippers, doubt as to the permanence of the present freight level. This illustrates the continuing threat of the idle tonnage and augurs ill for any immediate relief to owners so far as an increase in gross revenue is concerned.

From the broader point of view, the advance in sterling exchange is an encouraging indication so far as it goes, both as a hopeful sign in the broader fields of commerce and as an element reducing the disadvantage to American owners which was so notable when sterling was at or near bottom.

### Normal Trade Awaits European Stabilization

But no real return to normal may be expected in international trade until Europe's industries have gone much further toward revival; until national budgets have been so arranged that taxation will cover expenditure; until the nations realize that the greatest asset of any commercial people is the buying and selling power of its neighbors and customers. The general failure to recognize this last truth is one of the least hopeful signs of the moment. One observer has compared the recent relapse into policies of trade control and trade barriers on the Continent as surpassing any similar situation since the mercantilism of the seventeenth and eighteenth centuries. He adds (referring especially to the new-born nations of Central Europe):

*"Each of these states has been trying to render itself economically self-sufficient, through trade embargoes, restrictions and tariffs; each has, however, merely succeeded in rendering itself economically impotent."*

Considering the intimate economic relations of European industries and commerce, this is not very optimistic on the general situation. This is (in essence) confirmed by nearly all qualified observers who have had both the opportunity to judge and the training which should entitle their judgment to consideration. As to our own merchant marine, recent utterances seem to indicate that systematic Government aid, such as is generally considered essential, may be on the way. In the meantime, however, owners and operators must do the best they can under the conditions as they exist. Hence the conclusion is reinforced that the only logical course to be pursued for the moment is the rigid practice of all the time-honored economies and a diligent search for new methods of reducing operating costs.

### Economies Accomplished

If trade gets no worse, it is probable that the reduction of active tonnage has reached its limit. Economy in subsistence has nearly reached the same point, failing further general decline in food prices, etc. Some operators claim to have reduced this item to 50 cents per diem per capita, as against $1.25 a year ago, and about 35 cents minimum in 1913. Evidently there is not a great deal of room for further saving in this direction.

Further and progressive reductions in the pay roll aboard ship are natural developments of the situation and merely confirm the expectations of the trade since the last cut was established and accepted. The Shipping Board is contemplating and private owners have established a further step in this direction—said to reach from 15 to 30 percent—and the end is not yet. No spirit of prophecy was needed to predict that this must come. The mathematics of the situation have made this reduction imperative, failing a radical improvement in business which there was no reason to anticipate last August, and of which there is no real indication now. In truth, this reduction does little than to give official sanction to a pay scale which (in the lower ratings) has been in effect for some time. This is true, at least of many private operators. Sailors, like other people, have lately been wisely applying to their own plight the time-honored proverb concerning the relative value of half a loaf and no bread.

The reduction of construction, scrapping of uncompetitive tonnage and influence of ordinary sea mortality are sure forces working toward a healthier situation in the trade itself but they are slow. The same may be said of international trade, which is, probably (below the surface) tending toward better things. Meantime present conditions must be faced at once by those who purpose to stick in the business.

All this merely clinches the conviction that plans for the future cannot safely be based on any expectation of rates higher than those at present ruling, relatively to operating costs. This can only mean that fresh economies and improved methods must be diligently thought out and put in operation. For the closest figuring in office salaries, sea payroll, subsistence and stores will take but a small bite out of the deficits which now confront the shipowner.

### Importance of Efficient Personnel

The broad field in which there is yet much room for saving —direct and indirect—(a saving not easily expressed in figures, but always decisive in the year's balance sheet) is the progressive improvement in personnel, elimination of useless positions and a constant search for men who can fill the necessary jobs ashore and afloat in the most thorough and efficient manner.

This is the essence of time-honored preachments, extending from King Solomon to Elbert Hubbard, and yet it needs to be preached every day. At no time has it been more necessary than in the last seven years. As to the ship and wharf it has been more apparent and flagrant but in many offices, notably those of the newer companies, it has been not less obvious, and in the long run more expensive than inefficiency on the beach, or afloat. Longshoremen and sailors were demoralized by easy money and a surplus of jobs. But clerks, managers, operators and brokers were in many instances "put off their game" equally by the seductive influence of large pay, big profits and enormous commissions. In truth, it is a fair assumption that of the recent past troubles (as related to ship management) at least one-half were due to ignorance, carelessness, slackness and atrocious bad judgment at the shore end. The navigating end was at least protected to some extent by legal requirements as to licensed



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officers but in the office manned by greenhorns (or worse) the owner's property was wholly unprotected.

The relaxing effect of the abnormal conditions and the reflex influence of irresponsible competition no doubt affected the whole trade more or less. But by far the greater part of this disturbing factor was due to the new and inexperienced element injected into the trade by the war. The name of the firms of this class was legion; their influence was widespread and most unfortunate; especially accentuating the difficulties of managing or retaining competent help. Being easy marks for the wicked, they were responsible for a very considerable proportion of the extortion and swindling which were so scandalous during and after the war; also for added inflation in every item of cost.

Attention was called in the last article to the remarkable balance sheet of a Scotch company, as showing what might be done in keeping down gross or relative expense by an efficient office force. Such results are only possible with an able and experienced personnel, working at high pressure under proper supervision.

### Normal Standards Disregarded

The normal standards in this respect were nowhere maintained during the "boom" freights. Where loss of time was so expensive, it would have been the height of extravagance to sacrifice speed for the sake of economies which (relatively at least) were of minor importance. This, as a moral influence, has not yet been eliminated, although the improvement is already most marked. But in the two years succeeding the armistice it was notable everywhere. Among green operators, laxity, carelessness and even public disregard of the simplest commercial proprieties reached limits which may fairly be described as ludicrous.

The writer vividly recalls happening into one quite pretentious shipping office in mid-afternoon of a business day and finding the president, chartering manager and junior clerk shooting craps in the private office. Yet the concern was handling a very considerable business, because they had in some way secured considerable tonnage for charter and tonnage of *any* kind being then far short of an insistent demand, shippers or charterers were taking anything regardless of the source through which it was offered, and almost regardless of anything except the supreme necessity for room. Probably the crap-shooting president was being paid $20,000 per year and the total office expense was undoubtedly above $50,000.

This is an extreme case; but it illustrates an influence which was much in evidence up to the time when the freight market collapsed. Strong traces of this influence may still be noted in some quarters.

Such matters are elementary. The principles involved became axiomatic to real operators long ago, through the costly teachings of experience. During the period of depression which extended from 1901 to 1910, great progress was made along the line of scientific economy. Except for the demoralization of war markets (foreign, domestic and international), the whole trade would now be much further advanced in this respect. But as conditions now are, and owing to the continuing commercial and moral results of the big war, the shipping world has still some distance to go before it can even regain the average efficiency of 1913. War influences were demoralizing everywhere in the shipping world, but their effect was greatly more injurious here, owing to a greater expansion of activities, based on a relatively smaller nucleus of sound operating firms. The position reached in 1913, therefore, is not good enough today. Owners and operators of American tonnage must now face handicaps which did not then exist.

### Foreign Exchange Not Main Cause of Depression

Reverting to the depreciation of foreign exchange, this continues a notable disadvantage to every nation, which, now, like ourselves, pays its obligations in gold or its equivalent. This, of course, includes and affects all costs down to the smallest detail.

It is very commonly stated that the depreciation of foreign exchanges is a main cause in the depression of international trade, on which ocean transportation is so completely dependent. Such statements obviously involve a confusion of cause and effect. The low foreign exchanges are symptomic —not causative. International trade is wholly out of balance owing to conditions only too obvious. Let production and consumption, export and import, resume the normal relations on which the commerce of the last 75 years has been based and the international exchange rates would again become normal. But were it today possible to re-establish by edict the pre-war rates of exchange, the normal commercial relations between nations could not thereby be restored. Disease cannot be eradicated by mere palliatives. So long as the rates of exchange continue to be so distorted, they will, to some extent, react against the interests of American tonnage in varying degrees and (so far as this influence is concerned) in direct proportion to the degree of depreciation. As matters now stand with our maritime competitors, Japanese exchange is nearest to our own and therefore least troublesome to us. Sterling, perhaps next, and German, of course, the most menacing of all.

### Selection of the Ship

Assuming the most efficient and economical management as to wages, subsistence, office expense and personnel, the average operator today can at best only reduce operating losses. It is necessary to go further in the line of larger economies and the most important item of operating cost—bunkers—will provide now, and in the future, the field where the most telling economies are bound to be practiced. Leaving out the question of improvements still in the experimental, or semi-experimental, stage, it goes without saying that the first step in this direction lies in the selection of the ship. The next is of course in the choice of fuel—the kind and quality, and the bunkering schedule, which latter may vary according to prices, quality and facilities of ports at either end of the voyage.

A recent writer on this subject asserts that 40 percent of the incompetence of which we hear so much has lain in the choice of ships unsuitable for the completed service; and another 40 percent in the mismanagement of fuel. These are perhaps excessive estimates. No one will be disposed to deny, however, that the suitability of the ship to the intended service is a question with which experience alone is competent to deal, and then only when acting under able technical advice. Allowing for all the confusion and disturbance of trade, it is generally recognized that this matter has been handled, both officially and privately, with an amazing disregard of this main consideration. Sometimes it has been merely misjudgment, sometimes crass ignorance, but sometimes it has seemed to result from nothing less than criminal indifference. In many cases the financial results of such policy—or lack of policy—have been nothing less than appalling.

### As to Bunkers

The rise of oil as a power producer has been sensational but, in view of the apparent limits of ultimate supply and the certain increase in demand, it is not clear that oil fuel will show a permanent advantage over coal, so far as steamships are concerned. That will depend on many factors but chiefly upon the price of oil as compared with coal and upon the added gross revenue to be gained by the use of oil.

Ton for ton, oil is of course more expensive. Its advantage lies in its greater heat producing value per ton (a given service therefore requiring a less quantity of fuel) and in the revenue to be gained from the cargo capacity released, by the use of the less bulky and weighty fuel.

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Experience shows that the thermal value of good oil is about 50 percent greater than that of good coal, i. e., two tons of oil will produce about as much effective heat as three tons of coal. The waste of lift capacity in using coal is therefore 50 percent more than in the case of oil and such waste will of course appear in reduction of gross revenue paid by cargo.

When war freights were in vogue the results of this difference were amazing. At the peak of the market, and long afterwards, an "alternative burner" could not have afforded to burn coal had it been *free*. The loss in revenue on the sacrificed room would have far exceeded the total cost of fuel oil. Moreover, bunkers being unobtainable in Europe, all transatlantic steamers from this side had to bunker for the round trip, and the normal advantage of oil was thus doubled.

Therefore the advantage of oil for steam making varies with two main factors, which are the relative costs of oil and coal per ton and the level of freights.* Briefly, if oil costs, per ton, twice as much as coal, and the quantity required for a given service be one-third less (or as two to three), the relative first cost will be as twenty to fifteen in favor of coal, or a saving of 25 percent. From this, however, must be deducted the less costly bunkering and stoking of the oil, leaving a margin of first cost in favor of coal. Whenever this margin is wiped out by the increase in gross revenue, made possible by the use of oil, the latter fuel will be cheaper.

### The Bunkering Schedule

But when cargo is scarce, and the ship must sail partly empty, there will be no gain in revenue and oil will therefore be less economical. The net result must also be influenced by the level of rates and length of voyage, among other conditions.

With the wide difference in oil prices, here and abroad, the recovery by the English of their bunkering trade and questions as to the relative economy of different qualities to be decided (a most important point in both classes of fuel), it is apparent that there is here a large field for experience, but no place at all for novices. The planning of the long voyage bunkering schedule of the future is likely to be a work of art, requiring a high quality of technique. Certainly the subject is worth all the attention it is likely to receive. Wages and subsistence are constantly discussed and made much of, yet they amount on the average to not over 16⅔ percent of total operating expense. Fuel, on the other hand, may reach 40 percent or more on the ordinary freight carrier. Here is a field in which experience and training are imperatively required.

All these general and specific factors clearly mark the one great economy, without which all attempts at satisfactory results will be futile—a working force constantly increasing in training and efficiency, whose members fit their jobs and whose jobs fit them; extending from high executives to the junior positions; but of course being most essential in the upper grades.

The old established companies, both here and abroad, learned this long ago; and one of their many advantages over comparatively new comers lies in the quality of their selected personnel and in the fact that the best available talent naturally drifts to them. Given this instrument, the specific problems are shorn of half their terrors. Here is where most of the newer companies have been, and still continue, weak.

The greatest operating extravagance is to employ men who are too small for their jobs, because they come cheap. One piece of ignorance, or bad judgment, or bad management is apt to make any difference in salary look negligible.

There is no such major economy as a well selected and cooperating office force, and toward this end every well managed company is straining day by day. This result can only be achieved by a system of consistent and continuous selection, pursued from month to month and from year to year.

*Editor's Note: In the passenger trade, oil fuel has such an advantage in the speed and cost of bunkering, together with the extra space made available for passenger accommodations that the relative cost of coal and oil will probably not be a deciding factor for some years. For example, the *Olympic* is able to make one extra round trip per year since she was converted from a coal to an oil burner. The oil is pumped into her tanks in eight hours as compared with three or four days and over three hundred men for coaling.

# Steamship Operation and Its Problems

## R. H. M. Robinson, President, American Ship and Commerce Corporation, Addresses the American Society of Civil Engineers

"A DISTINCTIVE characteristic of the shipping industry is the great mobility of its productive factors," declared Mr. R. H. M. Robinson, president of the American Ship and Commerce Corporation and acting president of the United American Lines at the annual meeting of the American Society of Civil Engineers. He referred to ships as productive factors because the services emanating from them are the merchandise of the shipowners.

In calling attention to the 60,000,000 gross tons of shipping in existence today, Mr. Robinson pointed out that "directly or indirectly, actually or potentially, every ton of this 60,000,000 is a competitor of every other ton. A ship built for the New York-South America service does not directly compete with ships operating in the North Atlantic, but it may force another ship out of the South American service and into the North Atlantic. For this reason it is wrong to say that foreign tonnage does not affect conditions in the United States intercoastal trade, for a ship built in Japan for transpacific service may conceivably force an American ship from the transpacific into the intercoastal trade."

Although Mr. Robinson called attention to the limitation of the possible competition of standardized ships with vessels specially constructed to fit the requirements of particular trade routes he claimed that the excess tonnage in the world today was a significant problem to every shipowner. "It means intense competition, scrambling for cargoes, rate cutting and unprofitable business unless the situation is adjusted, either by reduction of tonnage or increase of trade. There has been wide discussion of the advisability of an international agreement for the scrapping of the present surplus of tonnage and the limitation of future building. Most shipowners, however, are holding on as long as they can in the hope that the adjustment will come through an increase of trade rather than a scrapping of tonnage.

### Advantage of Long Experience

"It is certainly not out of order to consider where American shipping stands with respect to this general situation and the long competitive struggle which is ahead of us. We suffer handicaps of a very serious nature. Our ships cost more to build, our marine wages are higher and our experience in the business is much more limited than is the case with our principal competitors. I do not intend to go fully into this subject, but there are several points in con-

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nection with the last mentioned handicap—our more limited experience—which I should like to discuss briefly.

"Long experience in a business means, among other things, the establishment of helpful connections and the creation of a certain good will in the markets served. In these traffic arrangements the newer American shipping companies lacked sadly during their efforts to get going just after the Armistice. Gradually they are establishing these connections at home and abroad. Too much emphasis cannot be laid on the value of good agents abroad. It is a phase of the problem which is often underestimated. Our ships need good cargoes homeward as well as outward, if they are to yield profits to their owners.

"Long experience also has its benefits in the matter of operating efficiency. Efficiency and economy are problems in every industry and nowhere more than in shipping. It must be evident that in a business which involves such great distances as is the case with a transoceanic shipping company, and in which unexpected conditions are always arising, inefficiency and waste are likely to play a prominent part. While making no claims to exceptional talent in the eradication of these evils, my study of the problem has brought to my attention certain possibilities which may be worth mentioning.

### WASTE

"Waste may occur with respect to materials and with respect to services. Dealing first with materials, we may look at the question of fuel, which constitutes a very large item in the operating cost of a steamer. It is perfectly patent that a boiler may be fed to a certain point with maximum results and that fuel used beyond that point is sheer waste. Generally, engine room crews are alive to this fact, but very often they carelessly or willfully disregard it.

"Not infrequently we find that ships are driven at an uneconomical speed, thus uselessly increasing the fuel consumption. It is a great temptation to a captain to push his ship to her speed limit in order to make port some hours, or a day, earlier. It takes the closest kind of checking and control by headquarters to eliminate this form of waste; that is to say, to determine what is the economical speed of a given vessel for a given trade under given conditions, and to enforce the proper observance of that speed.

### SUBSISTENCE

"As regards food, it is recognized that men must be well fed on shipboard, but the wastage that is sometimes encountered is prodigious. Certain of our ships, which have always been run on what was considered an economical basis, are now costing us no more per man per day than they were before the war, although prices are now about 50 percent higher. We have arrived at these results by giving the ships' steward a maximum figure to which to work, and discharging him if he goes above that figure without reasonable excuse. There have been relatively few discharges on this account. The men, however, are entirely satisfied with their food.

"Just as a steward may waste food, so a deck or engine crew may waste paint, lubricants and other supplies. It is a little more difficult to check up on this sort of inefficiency but there is no excuse for allowing it to run wild.

### CARE OF MACHINERY

"A very common form of waste is that of letting machinery run down for want of proper attention from day to day, so that in the course of time it breaks down entirely and requires extensive overhauling and perhaps replacement of parts.

"It is wasting services to carry a crew larger than is actually required. When business was good we thought we had our crews figured down to the practicable limit, but the pressure of hard times has brought about further reductions, which on some of our cargo vessels have amounted to as many as six, seven and eight men. This has been done, moreover, without handicapping or endangering the ship.

"Services are being wasted when the crew is allowed shore leave to the extent of necessitating that shore labor be brought aboard to do the crew's work. I may say that the American law requiring the payment of half the wages due, on demand of the seamen in port, induces the men to spend more time on shore than is good for themselves or the ship, and not infrequently leads to their being left behind, or to deliberate desertions.

### PORT DELAYS

"The most extravagant form of waste is wasting the services of the ship. Several idle days at port, during which time the vessel is earning nothing and is running up expenses at almost the same rate as if at sea, may easily destroy an otherwise fair margin of profit. Every hour counts when it comes to despatching a ship and it takes the concentrated, and one might almost say consecrated, efforts of the operating department, crew, stevedores and all others concerned, to eliminate losses from this cause.

"Recently our operating department worked out a scheme for consolidating at one port fuel delays which formerly had occurred at two ports. We have not figured out exactly what the saving of this arrangement will amount to in the course of the year but it will doubtless run into many thousands of dollars.

"It is self-evident that the elimination of waste in the operation of ships requires a high degree of co-operation as between management and men, and there are many schemes for encouraging this. There is the idea of creating a competitive spirit among the men by comparing the records of different voyages and of the various ships of a fleet. There is the idea of a bonus granted to officers and crew when a ship makes a particularly satisfactory voyage. Sick benefits and superannuation funds also work in this direction. In a large fleet the promotion plan may be effectively used; that is to say, efficiency among the men may be encouraged by holding out to them the possibility of getting higher ratings with the company as a reward for faithful service."

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## Free Ports and Free Zones

A RECOMMENDATION that there be established in the United States free zones or free ports similar to those with which Europe is familiar was made recently by a committee of the Foreign Commerce Department of the Chamber of Commerce of the United States.

Attention is called by the Chamber's Committee to six arguments in favor of free zones, as follows:

1. Free zones will direct increased transshipment trade to American ports.
2. Free zones will provide facilities for extensive consignment markets for dutiable raw materials.
3. The installation of free zones will provide great improvements in port and terminal facilities.
4. Free zones will make up for the inadequacy of a system of bonded warehouses and drawbacks, in so far as industries manufacturing primarily for export and dependent upon dutiable imported supplies are concerned, and in permitting the rehandling, conditioning and reexportation of imports.
5. Free zones obviate the necessity of advancing large sums for bonds and duty payments, the expenses of customs supervision, etc., and provide an opportunity for earnings for American bankers, insurance companies, forwarders, brokers, and others engaged in handling the port's business.
6. Free zones bring about a simplification and reduction of the work of customs administration.

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# Shipping Activities of The Department of Commerce

**By Waldon Fawcett**

*From the date of its organization, the Department of Commerce has been, logically, the branch of the United States Government closest in contact with maritime affairs and the best positioned of any of the executive departments to render practical aid to shipping interests. The mere circumstance of the grouping within this Department of the Federal institutions devoted to the science of navigation and the practice of commerce would presuppose such a relationship. For the Department of Commerce has served as a clearing house for the Steamboat Inspection Service, the Bureau of Navigation, the Lighthouse Bureau, the Coast and Geodetic Survey and the Bureau of Fisheries.*

RISING above the narrow considerations, the technical considerations, if you please, of the specific maritime activities there has always been manifest in the policy of the Department of Commerce an ambition to offer encouragement to shipping development in its larger or broader aspects. Even in the days when it appeared impossible to arouse widespread public sentiment, the voice of the Department of Commerce was persistently raised in behalf of an American merchant marine just as the Department has habitually collected information with respect to ship subsidies in all lands against the time when Congress will decide to adopt a subsidy system in behalf of the American merchant marine and will have need of models on which to pattern its program. Such has been the versatility of effort that it has several times been suggested that the official title should be "Department of Shipping and Commerce."

Constructive as was the work in behalf of shipping that the Commerce Department performed in the past, a new era was ushered in with the appointment of Mr. Herbert Hoover to the position of Secretary of Commerce. Mr. Hoover's varied business experience, culminating in war-time responsibilities that were conducted on the broadest scale, gave him an acute appreciation of the importance to national development of a progressive policy in the provision of the utmost facilities of water-borne commerce. In an effort to stimulate, by every possible means the shipping and shipbuilding activities of the United States the work of the Commerce Department has been expanded along original lines mapped out by Secretary Hoover. Although the extension has been encompassed within the period of a single year and has not yet had opportunity fully to demonstrate its efficacy, it is apparent that the Hoover administration is to reveal in the commercial annex of the Government at Washington new potentialities of encouragement to shipping.

### Bureau of Foreign and Domestic Commerce

One of the most notable efforts in behalf of American shipping interests which has characterized the reorganization conducted by Secretary Hoover has had its outcropping in a quarter where such initiative would be least expected. The Bureau of Foreign and Domestic Commerce has always been one of the most important cogs in the commerce machine but it has been devoted, as its title might imply, almost wholly to the promotion of commerce. Shipping problems have been dealt with only incidentally and to the extent that transportation arrangements affected barter and trade in various markets. Under the new status, the chief function of the Bureau is, as of yore, the discovery and exploitation of "trade opportunities" but shipping interests are to have their distinct share in the "information service."

Prior to a year ago, the organization of the Foreign and Domestic Commerce institution was made up principally of two groups of divisions. There were regional divisions such as the Far Eastern and Latin American and there were technical divisions such as those devoted respectively to foreign tariffs, commercial laws and statistics. With the introduction of the Hoover ideals came the addition of a number of "commodity divisions," so-called. A division, in charge of a specialist, is devoted to each of the basic commodities that form the bulwark of American industry, as, for example, iron and steel, lumber, machinery and electrical equipment. With the advent of these commodity sections there came a Division of Transportation and Communication, in charge of Eugene S. Gregg, and in this new agency American shipping interests may be said to have come into their own in so far as it is beneficial to have the aid of an intensely observant "intelligence service."

### General and Confidential Information for Shipping Interests

That is what this new division is, essentially, a bureau of information for shipping interests. By means of the organization of United States consular officers posted throughout the world, by means of special commercial agents and field representatives of the Bureau on roving commission, and by means of intensive, systematic perusal of the press of the entire world, this unique institution undertakes to become apprised promptly of any and every development that might by any possibility affect United States shipping interests. Is Belgium reestablishing its shipping connections? Are port improvements authorized in this corner of the world or is a new coaling station instituted in that corner? The transportation division aims to be the first to get the information for American consumption and to get it in full detail. By means of an internal administrative system the shipping information is segregated from the other data on transportation subjects and is available to shipping men. It might be added, too, that the news of shipping developments to which the Transportation Division gives publicity in Commerce Reports and the other publications of the Bureau of Commerce by no means represents the sum total of the garnered knowledge. The shipping annex is obtaining all the while a wealth of confidential information on shipping subjects which, for one reason or another, it is not enabled to print but which will be communicated in confidence to any authenticated American shipping interest that might be affected by the news.

### Specific Services Performed by Department

Coincident with this effort to give American shipping men a bird's-eye-view of the world-wide panorama of maritime development Secretary Hoover has drafted the far-flung field organization of the Bureau of Foreign and Domestic Commerce to facilitate by every possible means the movements of American shipping. Cooperation with the Shipping Board has been particularly close and effective. Illustrative of recent effort in this direction it may be cited that, through the intervention of the London office of the Commerce Bureau, the British Ministry of Transport was induced to instruct the Great Western Railway to give better facilities for American shipments. The London branch was also enabled to



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hasten the installation of unloading equipment at Fowey to facilitate the quick "turn around" of Shipping Board vessels at that point. On the other hand, it was due largely to representations made by the Near Eastern and Far Eastern Divisions of the Commerce Bureau that the Shipping Board has been brought to a realization of the importance of maintaining adequate service, via direct lines, to Eastern ports.

During the past year or two the Bureau of Foreign Commerce has revealed one form of useful service to American shipping interests which it is to be hoped will not often be invoked but which is of the highest practical value when needed. Reference is made to the reportorial service covering congestion at foreign ports. At Havana, Cuba; Callao, Peru, and other ports where United States vessels were affected by the unprecedented congestion, the representatives of the Commerce Bureau kept constantly in touch with the situation and were enabled by prompt communication by cable to qualify the Department at Washington to give helpful advice to shippers and ship operators. A special committee from the Bureau visited Cuba at the height of the port congestion at Havana. Not only did this visit bring tangible results in relief of the tie-up but it also established an important precedent in justification of business action rather than diplomatic action in the treatment of shipping problems that may involve two or more nations of the western hemisphere. Notable as has been the work performed by the Foreign Commerce Bureau in the recent past Secretary Hoover is ambitious further to extend the efforts in behalf of shipping. For example, he is to seek from Congress funds that will enable the establishment of technical divisions devoted to "Packing for foreign shipment" and other export responsibilities that are integral with shipping routine.

### Improvements in Navigation Laws

The Steamboat-Inspection Service is a branch of the Department of Commerce that bids fair to develop, under the general supervision of Secretary Hoover, more discernedly in line with the needs of the shipping community. For one thing, a renewed effort is to be made to secure the amendment of Sections 4433 and 4418 of the Revised Statutes in regard to the working and hydrostatic pressure of boilers. This is an issue which has been raised repeatedly by the manufacturers of boilers and the service has been criticized because of its rules and regulations but the modernizing of these rules has waited upon authority from Congress.

A drive will also be made to bring about the amendment of Section 4472 of the Revised Statutes which governs the transportation of dangerous articles. As now enforced this law is worse than obsolete. It was originally enacted solely to meet conditions induced by the operation of a certain class of vessels on the western rivers of the United States whereas we find it applied today to vessels engaged in offshore trade. If Congress can be induced to take the action that has been recommended, interests engaged in the shipment or transportation of commodities on steamers carrying passengers or on freight vessels would be in a position to know at all times what rules governed the transportation of any dangerous article covered by the code instead of being confronted, as at present, with a formidable amount of red tape. Furthermore, a revision of the law would make it possible to carry on steamers carrying passengers certain commodities that may with safety be carried but which under the present law are entirely prohibited.

### Bureau of Navigation Active

The Bureau of Navigation seems to be animated, under the present administration, with something of the same progressive spirit that is manifest in other subsidiaries of the Department of Commerce. Shipping men will rejoice that the new administration is pledged to exert all possible influence to bring about the enactment of the long-awaited and sorely-needed American load line law. It is evident that there cannot be maintained indefinitely the informal arrangement made in 1919 with the authorities of the United Kingdom whereby there is temporary recognition for load lines marked by the American Bureau of Shipping according to the British freeboard tables and rules. The enactment of a load line law would necessitate closer cooperation on the part of the inspection branches of the department with the American Bureau of Shipping and there would, in turn, be a necessity for a small staff of trained ship surveyors in the institution at Washington.

### Qualified Experts for Special Services Needed

Eloquent of practical service of the utmost significance to American shipping interests in more ways than one is the aspiration of the Department to create a staff of surveyors similar to that maintained by the British Board of Trade. Such specialists would be available for counsel and decision on questions inseparable from the administration of the navigation laws. And inasmuch as these laws are shortly to be extended and elaborated there will be a proportionately more urgent need for such advisory service. Particularly is there need on Uncle Sam's staff for experts qualified to represent the United States at the important international conferences on safety at sea and kindred subjects which are to be resumed this year.

It will be recalled that the loss of the steamer *Titanic* resulted in an international technical conference that took up such fundamental principles of ship construction as the subdivision of hulls of ocean passenger steamers. The outbreak of the World War postponed the carrying into effect of the international convention that grew out of that conference but the record of the war, particularly in the havoc of submarine destruction, only served to emphasize more strongly the need for the formulation of scientific principles covering this phase of ship construction. To the end of securing an international agreement upon hull construction rules there was an informal meeting last May at which Great Britain, France and the United States were represented. According to the present plan this will shortly be followed by a general conference at which it is hoped that an international agreement will be ratified. To have within the personnel of the Department authorities qualified to represent creditably the United States at this and similar conferences is the immediate ambition of Secretary Hoover and his aids.

### Regulation of Radio Communication

Governmental supervision of radio communication is another responsibility integral to shipping with respect to which the present administration at the Department of Commerce has views distinctly at variance with some of the ideals that have prevailed in the past. It is admitted that the regulation of radio communication has become a matter of increasing intricacy and difficulty and that present regulations in the United States do not meet requirements. However, the Department's attitude is that it would be a mistake to press for action by Congress in revision of the regulations applicable to this country alone when there is prospect of revision at an early date of the international regulation of radio communications, in accordance with the project launched in the autumn of 1920 in which there was joint action by representatives of the United States, Great Britain, France, Italy and Japan.

Disintegration of the United States Coast and Geodetic Survey, with attendant loss to the shipping interests of the country, is the most disquieting feature of Secretary Hoover's inventory of the Department of which he has taken charge so energetically. A new building is needed as a home, if this Bureau is to function to the fullest extent, but even more serious than this lack is the low level of salaries obtaining in the Survey which is operating to drive to private fields of employment the experts upon whom the nation has been

(*Continued on page* 90.)

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# Developments in Marine Insurance

## Retrospect of 1921—Ship Lien Issue— Marine Policy Not Valued—Model Bill Passes—Lying-up Returns

**By "Bordereaux"**

WHEN the final company reports are all in it is not likely that the year 1921 will be found to occupy a particularly impressive place in the history of the business. Enough is in evidence to warrant giving it a very modest ranking indeed. Few marine insurance writers made any money at all last year; and where there was a margin of profit it was narrow to the vanishing line.

One of the reasons is because 1921 was a year of readjustment, the companies groping their way back to normal and familiar conditions; and in such abnormal circumstances it would take a confirmed optimist to anticipate any great degree of money-making. The "war babies" have been shyly withdrawing, and several of the weaker sisters have followed their wise lead. The experienced, old-time offices are still on the job and will doubtless continue to function as actively as ever.

There have been encouraging developments in 1921, and chief of these has been the disposition to get together—something traditionally lacking hitherto among American marine underwriters. This has had its manifestations in the development of the American Marine Insurance Syndicates, the launching of the United States Salvage Association, the merger of the National Board of Marine Underwriters with the Board of Underwriters of New York to the conservation of much expense and effort, and the fine co-operative spirit shown in backing the important marine insurance Federal movements—such as the Load Line Bill, the Model Bill, and the fight to amend the Harter Act. Unquestionably the Syndicates have helped immensely to stabilize the hull insurance market, and their writings have been extensive.

The decline in trade has restricted premium receipts from cargo writings, and this has been still further accentuated by the steady fall in values. Losses in the cargo line have been both numerous and heavy, due to the disposition of foreign consignees to decline deliveries in the face of an adverse market.

So much for 1921. That is past and gone, and insurance men are more interested in what 1922 gives promise of handing them. And, from present indications, the outlook is none too bright, largely because of the intensity of competition and the tendency to cut rates. Americans are charging this condition to British eagerness for business over here. The British insurance market is notoriously top-heavy, as a result of war expansion; and preferential rates have carried to the other side several of our most desirable fleets and numerous cargo lines of exceptional attractiveness. This unsettled condition inclines some of our most sagacious underwriters to anticipate two or three years of hard work to hold business, along with a still more slender margin of profit.

## Ship Lien Issue Settled

THE United States Supreme Court recently passed upon a legal point involving between twenty and thirty million dollars, the question being one of liability by privately owned vessels for damages inflicted by them while they were still under Government control. It is a matter that vitally interests the underwriter. It is estimated that there are between three hundred and three hundred and fifty cases of this character pending throughout the country, and practically all for collision damages sustained by privately-owned vessels while the latter were still being operated by the Government. The claimants contend that a lien attached as soon as the collision occurred, and that although these liens were not enforceable because of the fact that the Government had not consented to be sued, nevertheless they became enforceable the moment the vessel passed into other than Government hands. The Supreme Court sustained the contention of the Government that the lien never came into existence because the Government was immune from liability for a tort and that, as this was a tort, no liability was attached to that vessel that could pass when the vessel was restored to its owners from whom it was requisitioned.

## Marine Policy Not Valued

ON the issue that a marine contract is not necessarily a valued policy, the United States District Court, S.D., New York, recently found for the libelant in an admiralty suit. In his decision Judge Learned Hand held that in a contract of marine insurance on a particular cargo for a particular voyage, effected by a binder incorporating by reference the New York lighterage form, the insertion of the words "valued at sum insured" does not change the normal character of the policy as a contract of indemnity under which the insured in case of loss is entitled to recover only the actual value of the property lost. The court observed that it is the practice in foreign hull insurance to take out true valued policies, but that no such practice exists in domestic insurance, either hull or cargo. When the parties do not take out such insurance, if the valuation be not fraudulent, both sides are bound. It was objected by the court that the language ought to be clearer when the libelant seeks to change the policy from its express and usual meaning—i. e., as a contract of indemnity—to a contract to pay a fixed sum in the event of loss.

Another important point was that the binder was upon this cargo only for this particular voyage, though its duration was uncertain. It had also to be remembered that the assured drew up the binder. It was held that the phrase "valued at sum insured" referred to the coinsurance clause in the policy and did not change the normal, and expressly agreed, character of the policy as a contract of indemnity.

## Barge Canal Writings

WITH the closing of navigation in the New York State Barge Canal, the underwriters viewed their season's accounts with rueful countenances. Briefly, they lost money on their operations. Numerous strandings placed the balance on the wrong side of the ledger. Considerable disappointment was experienced with respect to the unexpectedly small amount of tonnage employed in canal shipments.

## Loose Phrases Tabooed

CONSERVATIVE American underwriters have been gratified to learn from a copy of a letter written by the Institute of London Underwriters to similar organizations in other parts of the world that stringent action is being taken by that body to correct the use of loose phrases in insurance policies. The letter lays particular stress on the



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term "all risks," and points out that due to interpretation by the courts of this phrase in accordance with its liberal meaning rather than in the light of its insurance significance underwriters are being held for all loss of whatever nature to the goods insured. Conservative underwriters in America have consistently refused to follow Lloyd's lead in the use of this and similarly loose phrased clauses, and it is a satisfaction to them to note that their stand is at last vindicated.

## "Model Bill" Passes the Senate

MUCH gratification is felt by insurance men over the ease with which the much-mentioned "Model Bill" passed the United States Senate, and they are convinced that the identical House measure will have no less favorable an experience. Although the bill applies only to the District of Columbia it is designed to constitute a working basis for similar legislation in many if not all of the individual States. It clears the way for American underwriters being placed on a parity with their foreign competitors by the removal of legislative obstacles which now stand in their way and with which the underwriters of other nations are not obliged to contend.

## Shipments on Cast-aways Are Total Losses

IT is universally admitted that many vessels are being deliberately sunk, and have been for the past eighteen months, in order that their owners may take advantage of the high valuation under which they were insured. In all of these deplorable instances the "innocent bystander" has been the shipper. His plight is indeed a sorry one, for it has been shown, over and over, that he cannot collect any claim on his insurance policies, nor can he obtain satisfaction from the party to whom he should naturally have recourse—the shipowner. The law is rigid on the point that barratry, in which the shipowner participates, deprives him of the protection of his policy, and the shipper is no less deprived of his right to insurance recovery. He cannot hold the shipowner liable when it is shown that the latter was a party to the fraud. Marine policies cover certain definite perils, but casting-away is not one of them. Nor can underwriters be expected to create the deplorable precedent of paying losses, however arising, which are not caused by perils insured against. The only course for the shipper to take is to pay closer attention to the character of the shipowners with whom he entrusts his property.

## Lying-up Returns

MORE or less trouble is reported from England because of the settlement of lying-up returns when the period during which the vessel was laid up is broken by the cancellation of the policy in order that cheaper insurance might be effected. It is contended by many underwriters that under such circumstances the proportion of the return attaching to each policy is not collectible. It is an issue that should not be raised at all. When underwriters permit an owner to cancel his policy and to replace it by a cheaper one they thereby place him in the same position as if the policy had expired in the normal way to be succeeded by another one. It is customary to allow lying-up returns when the period for which they are collected overlaps on succeeding policies, and the fact that a policy has expired through cancellation and not exhaustion does not alter the position in the least. Again, the amount at stake on these overlapping returns must be minute compared with the amount that underwriters have sacrificed by consenting to the cancellation of policies and the substitution of others at cheaper rates. London underwriters are expressing the hope that their confreres as a whole will not countenance the attitude in this matter taken by some of them.

## Change in Syndicate Officers

LAWRENCE J. BRENGLE has been appointed active manager of the recently organized United States Salvage Association—which is the operating agent of Syndicate "A" of the American Marine Insurance Syndicates—in succession to Charles R. Page, who recently resigned to engage in marine insurance. John H. Trowbridge, chief clerk of the Syndicates, becomes assistant manager. Gomer H. Rees has resigned as secretary of the Salvage Association, and Mr. Page becomes a manager of Syndicate "A." Mr. Brengle has been the underwriter of Syndicates "B" and "C," and will continue to discharge those duties in connection with his new ones. He brings to his Salvage Association work a wide experience in the handling of wrecked and damaged vessels on both the Atlantic and Pacific coasts. He is a Philadelphian by birth, and has spent ten years in the extensive operations of the large brokerage firm of Johnson & Higgins. Mr. Trowbridge was at one time secretary of the Insurance Advisory Committee of the Food Administration Grain Corporation, and has been with the Syndicates for more than a year.

## Losses Caused by Stowaways

ARE marine underwriters liable for damage or loss caused by stowaways? This rather singular question is not without point at this time, in view of a recent heavy claim submitted to New York insurers arising out of a fire in a cotton cargo directly traceable to stowaways lighting a match while lying concealed among the bales in the hold. Despite the fact that a marine insurance policy specifically states that it covers against fire, still there is a question as to the liability of underwriters for such a loss as this. It would seem that, if a loss by fire is caused by stowaways, as fire is one of the insured perils, the underwriters are liable unless their policies contain a clause specifically excluding loss by stowaways, or words to that intent. When a fire is caused by the negligence of the crew the underwriter is liable simply because fire is an insured peril, and the causes responsible for the fire are immaterial, the doctrine of proximate cause not being involved.

Those who maintain that the underwriters are not liable for such a fire as this stowaway one base their contention on the ground that the fundamental principle of marine insurance was created for the purpose of covering fortuitous losses and that a fortuitous loss does not contemplate the careless or intentional act of a party who bears no relationship to the venture. They insist that specific exclusion is not necessary. Under the American law the carrier is doubtless liable for this stowaway loss, but that fact does not of itself excuse the underwriters from their responsibility.

## Shipping Activities of the Department of Commerce

(*Continued from page* 88.)

dependent for the fidelity of its nautical charts, tide tables, current, magnetic and triangulation data. Handicapped as it is, the Coast and Geodetic Survey is prosecuting important work; for example, a beginning has been made in securance of observations in New York harbor, the ambition being to provide a systematic tidal and current survey that will aid shipping men by furnishing more accurate current predictions for the docking of large vessels and that will also be of use to the engineers charged with the development at New York of what will be the greatest harbor in the world.

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# Shipping and Shipbuilding in Great Britain

## Vessels Selling at Pre-War Prices — Future of British Shipyards Uncertain—Outlook for Ship Repairing Gloomy

By W. H. Wendon

SIGNS are not wanting that the shipping trade of Great Britain may in the early future take a turn for the better. No surer indication could be found than in the fact that more than one of the country's most astute owners—men who had the good sense to dispose of their fleets at the enormous values current during the late boom—are re-entering the shipowning world and, as compared with the prices at which they sold the boats, are re-acquiring these or purchasing others at something approaching pre-war prices. The course adopted by Sir Walter Runciman, for example, is full of significance. When Sir Walter Runciman sold his well-known "Moor" fleet to the ill-fated Western Counties Company, there were many in the shipping world who were amazed at his action, for at that time—February, 1920—there were hopes that the fabulous values then current would ascend yet higher. But, as is now only too well known, the slump set in with remarkable rapidity, justifying the foresight of Sir Walter Runciman and a few—but very few—others.

But that is a matter of history. What concerns us now is that, as I have hinted, the older shipowners are coming into the tonnage market again, no fewer than six new 9,000- to 11,000-ton deadweight steamers, in addition to older boats, having been acquired by Sir Walter Runciman on behalf of his re-constituted Moor Line. It is particularly noteworthy that these new vessels, which have been constructed by Messrs. William Doxford & Sons, Sunderland, are similar to those which before the war realized sums ranging between £81,000 and £95,000. These figures compare with the £8 per ton deadweight just paid by Sir Walter Runciman, thus exemplifying the tendency to pre-war quotations.

A further recent instance of a shipowner having the courage of his convictions to the extent of purchasing a large fleet is that of Mr. D. R. Llewellyn, of Cardiff, who has become the owner of the Maindy fleet, the method of acquisition being purchase by auction, following seizure by the bank owing to the Maindy Company being unable to meet its obligations.

### Fluctuations in Shipping Values

It is not without interest at this juncture to trace the fluctuations in value of, say, a 7,500-ton deadweight cargo carrier. Prior to the Great War the highest price obtained for a vessel of this description was the then huge sum of £60,630, which was obtained towards the end of 1900. With the release of tonnage after the South African war, however, values immediately dropped and by the end of June in 1901 only £49,250 was obtainable.

The fluctuations in the ensuing ten or eleven years are too numerous to describe within the space alloted to this summary. Suffice it, therefore, that by November, 1912, £58,000 was the approximate value placed on this size and type of vessel. From that date until just before the opening of hostilities in 1914 there was a consistent decline in value, the final quotation recorded prior to the war being £45,000. Had the war not intervened, there is excellent ground for believing that values would have dropped still further, and, in the opinion of those competent to judge, the record low figure of 1908, namely, £36,000, would have been attained. But the gods decreed otherwise, the record high figure of £34 10s. per ton deadweight, equivalent to £258,750, being recorded in March, 1920. To-day the best that can be obtained for the type and size of boat under review—and, as already stated, for 9,000- and 11,000-tonners—is £8 per ton on the deadweight, or less than one-fourth of the value current two years ago.

### Possibilites of the Future

Now that the new year is fairly launched, it should not be without value to turn for a moment to what our leading shipowners, and those engaged in allied industries, consider to be the possibilities and probabilities of the future. One of the foremost men interested in all branches of the shipping trade—that is to say, ship owning, construction, repairing and chartering—is Mr. J. C. Gould, Member of Parliament, of Cardiff. Mr. Gould, in common with most business men, breathes a sigh of relief at the passing of 1921, which period he rightly describes as one of catastrophe as regards trade and commerce, the slump in its unparalleled suddenness sweeping many firms off their feet and causing widespread unemployment. As Mr. Gould points out it was generally anticipated that the slump would be a gradual one, and would be accompanied by a decline from the abnormal values at which goods and services had soared.

### Too Little Business Rather Than Too Many Vessels

But the apparent excess of shipping tonnage, in Mr. Gould's view, is purely artificial. There are, he thinks, not too many vessels on the water—rather, that it might be successfully argued that the depression lies in the fact that there is not enough business to employ the present vessels available. This line of reasoning, as I am sure Mr. Gould would be the first to admit, is open to strong criticism, but at all events it is evidently Mr. Gould's considered opinion, and therefore is entitled to be weighed in the balance, even though it eventually be found wanting. The basis for Mr. Gould's contention is this: By eliminating tankers, passenger liners and intermediate vessels, he arrives at the conclusion that the comparative excess of tonnage is very small. To which, I might add, there is the undoubted presence of large numbers of obsolete and semi-obsolete merchant vessels.

In conclusion, while Mr. Gould does not think things are to be much better for some time to come, he does not despair of the future. He points to the better spirit in trade unionism to-day than there has been in the past and, with the saving of disastrous losses of time consequent on industrial disputes (according to a German statistician, Britain since the Armistice has lost 73½ million out of 90½ million working days lost in the whole world) there is little doubt that brighter days are in front of the British shipping and allied industries.

### Prospects of British Shipyards

As to the prospects of British shipyards, none could speak with greater knowledge than Mr. James Lithgow, the president of the Shipbuilding Employers' Federation. Mr. Lithgow traces the present slump to the abnormal prosperity which affected our industrial community in both a material and a moral sense. The material standpoint may be said to be that productive facilities have been improved and extended, and the economies possible to be effected will be discernible when production has a chance to get going. The



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moral standpoint may be summed up, that present-day workers, and particularly the younger generation, have the fixed idea that the shortest possible day's work should be given in exchange for the maximum wage obtainable. That, however, is, let us hope, a passing phase.

To return to Mr. Lithgow's analysis, it is of no little interest to note that he views "mass production," either in the shipbuilding industry or any other sphere, as beneficial from the point of view of opening up possibilities for producing goods at a price that a greater number of people can pay. He instances the fact that, if a Ford motor car cost as much as a Rolls Royce, there would be no owners of Fords, but, on the other hand, there would be far fewer owners of motor cars. In the same way, Mr. Lithgow records "payment by results" as being of value to industry in ensuring the largest reward to those who exert extra effort, and in reducing at the same time the total cost of the work performed. Mr. Lithgow is especially serious when touching on the question of foreign competition. Suggestions that this is is of no consequence, and that British shipbuilding can flourish without foreign orders, show, as he points out, ignorance of the facts.

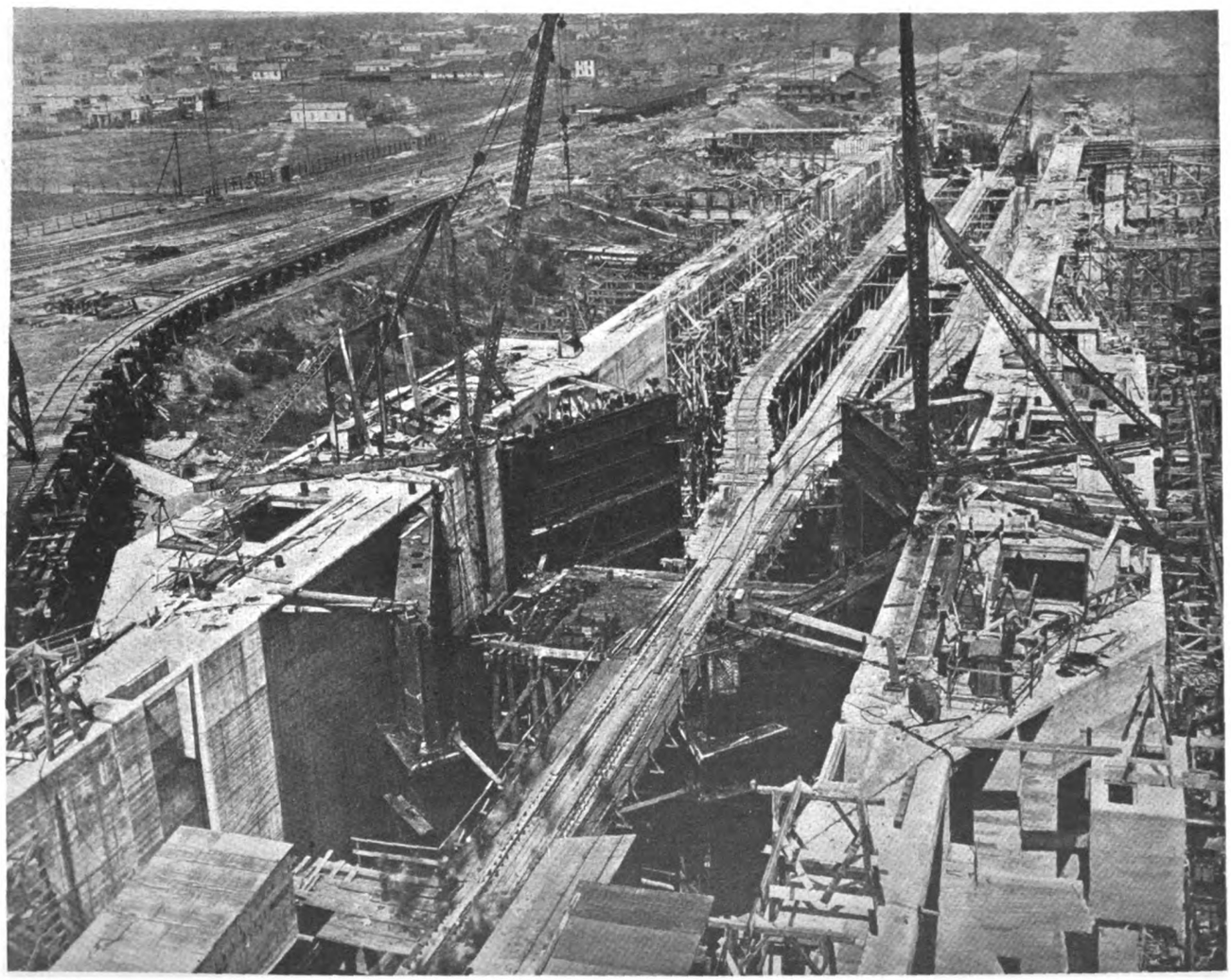
### Shipbuilding Depends on Rise in Freight Rates

From a general point of view, the prospects of the British shipbuilding industry are, to say the least, uncertain. The trade, of course, benefits by a rise in rates of freight, for it is then that shipowners consider the advisability of laying down fresh tonnage. But such a fortunate occurrence does not come about until some time after the first signs of a shipowning revival are apparent and, in the meantime, the builder has to bide his time.

But there is another aspect. Throughout the British Isles, in common with other parts of the world, there are large numbers of ships, some nearly completed, others scarcely started. Work on these boats has been under suspension for periods reaching in some cases eighteen months. It is on the cards, therefore, that, with brighter chartering prospects, owners may instruct builders to carry on with construction of their partially finished vessels. Such has, indeed, already been the case in a few notable instances, particularly in regard to liners, where the slump is not so grave.

### Ship Repairing

The outlook in the ship repairing industry is as gloomy as, if not gloomier than, that existing on the whole in the "parent" trades—shipbuilding and shipowning. According to one authority, in marked contrast to the comparatively bright outlook at this time last year, the conditions existing in the ship repairing trade at the present time are dismal in the extreme. Indeed, no one engaged in the industry can recall such a hopelessly black prospect. It is generally regarded as being, without doubt, the worst time ever known in the industry.



*(Photograph by Kadel & Herbert News Service, N. Y.)*

**Locks in Industrial Canal at New Orleans, the Second Largest Inland Waterway Scheme in America, Nearing Completion**

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Motorship Californian Fitting Out at Merchant Shipyard

# New American Motorships Californian and Missourian

## American-Hawaiian Vessels the First Large Motorships to Be Specially Designed and Built in Their Entirety in the United States

THE *Californian* and *Missourian* mark an era in American shipping and shipbuilding by virtue of the facts that they are the first large motorships specially designed and constructed in the United States and that the machinery is the first of its kind to be constructed exclusively in an American shipyard.

The hulls for the vessels were constructed at the yard of the Merchant Shipbuilding Corporation, Chester, Pa., and the machinery was built and installed by the William Cramp & Sons Ship & Engine Building Company, Philadelphia, Pa., who are licensees for the Burmeister & Wain marine Diesel engines.

Much credit is due the officials of the American-Hawaiian Line for their initiative and judgment in adding these modern vessels to their fleet.

The vessels, which take their names from two former American-Hawaiian steamers sunk by submarines during the war, are of the flush deck type with officers' and crews' accommodations and bridge located together amidship, as is generally characteristic of vessels belonging to this steamship company. This arrangement has much to be commended as it permits the maximum number of cargo hatches and winches to be employed for rapid loading and unloading of cargo and also places the bridge in an advantageous position for the captain in handling the vessel when coming alongside docks.

The main and auxiliary machinery is identical in type to that of the motorship *William Penn,* the machinery for which was installed by the William Cramp & Sons Ship & Engine Building Company in a hull built at the Gloucester Plant of the Pusey & Jones Company and afterwards towed to the Cramp yard for machinery installation. There is a difference, however, in the number of auxiliary engines, the American-Hawaiian vessels having four instead of three, due to the larger number of winches employed.

The motors and generators within the engine room were supplied by the Diehl Electric Manufacturing Company to special requirements. The motors for driving the pumps have ball bearings and are totally enclosed.

The machinery has been built to conform to the requirements of Lloyd's Register of Shipping.

### Cargo Handling Machinery

The cargo handling machinery for these ships has been most carefully selected and consists of fourteen double-geared winches and two Shepard Crane & Hoist Company's winches on each ship. The fourteen winches for the *Californian* were manufactured by the American Engineering Company and the winches for the *Missourian* were made by the Maine Electric Company. Each winch is driven by a thirty horsepower electric motor of the "Mill" type. The motors and the controllers for the *Californian* were supplied by the Westinghouse Electric and Manufacturing Company. Those for the *Missourian* were furnished by the General Electric Company.

### Main Engines

The main engines consist of two Cramp-Burmeister & Wain four cycle marine Diesel engines, of the crosshead type and having six cylinders each with a bore of 29⅛ inches and a stroke of 45¼ inches. Each engine is capable of developing continuously 2,250 indicated horsepower when turning 115 revolutions per minute. They are of the enclosed type and arranged for forced lubrication throughout. To the forward end of each engine is fitted a three-stage compressor for supplying injection air of 850 pounds pressure.

### Auxiliary Machinery

The auxiliary engines are of the typical Burmeister & Wain four cycle design, having two cylinders each. They are rated as 100 brake horsepower each, and are direct connected to 65 kilowatt direct current generators running at 300 revolutions per minute.

Three centrifugal cooling water pumps, arranged along the forward end of the engine room, supply salt water cooling to the main and auxiliary engines and maneuvering compressor, one being usually all that is required, with the other two as standbys. The water to the main engines divides on passing through the jackets of the compressors, part going



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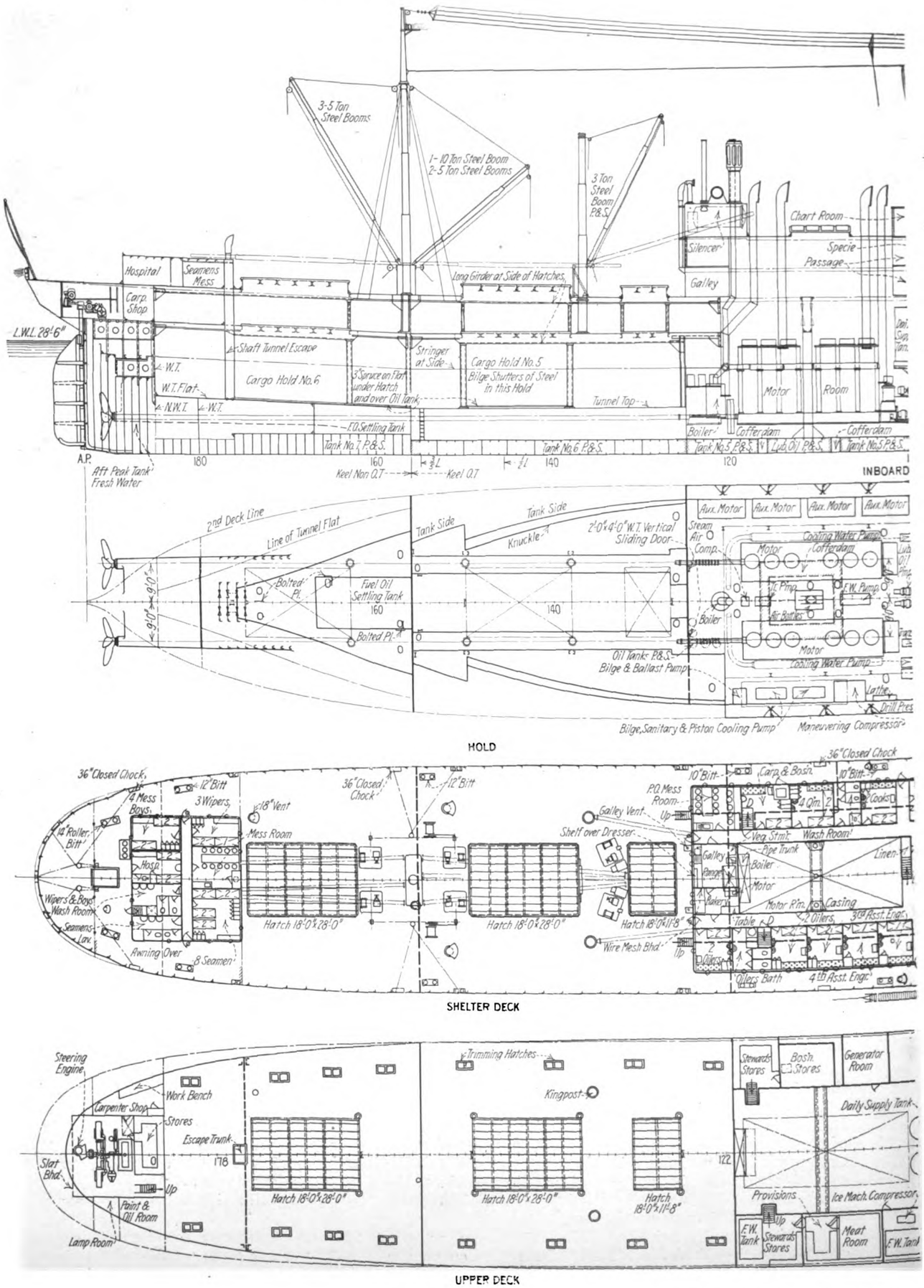


**Profile and Deck Plans of Motor**

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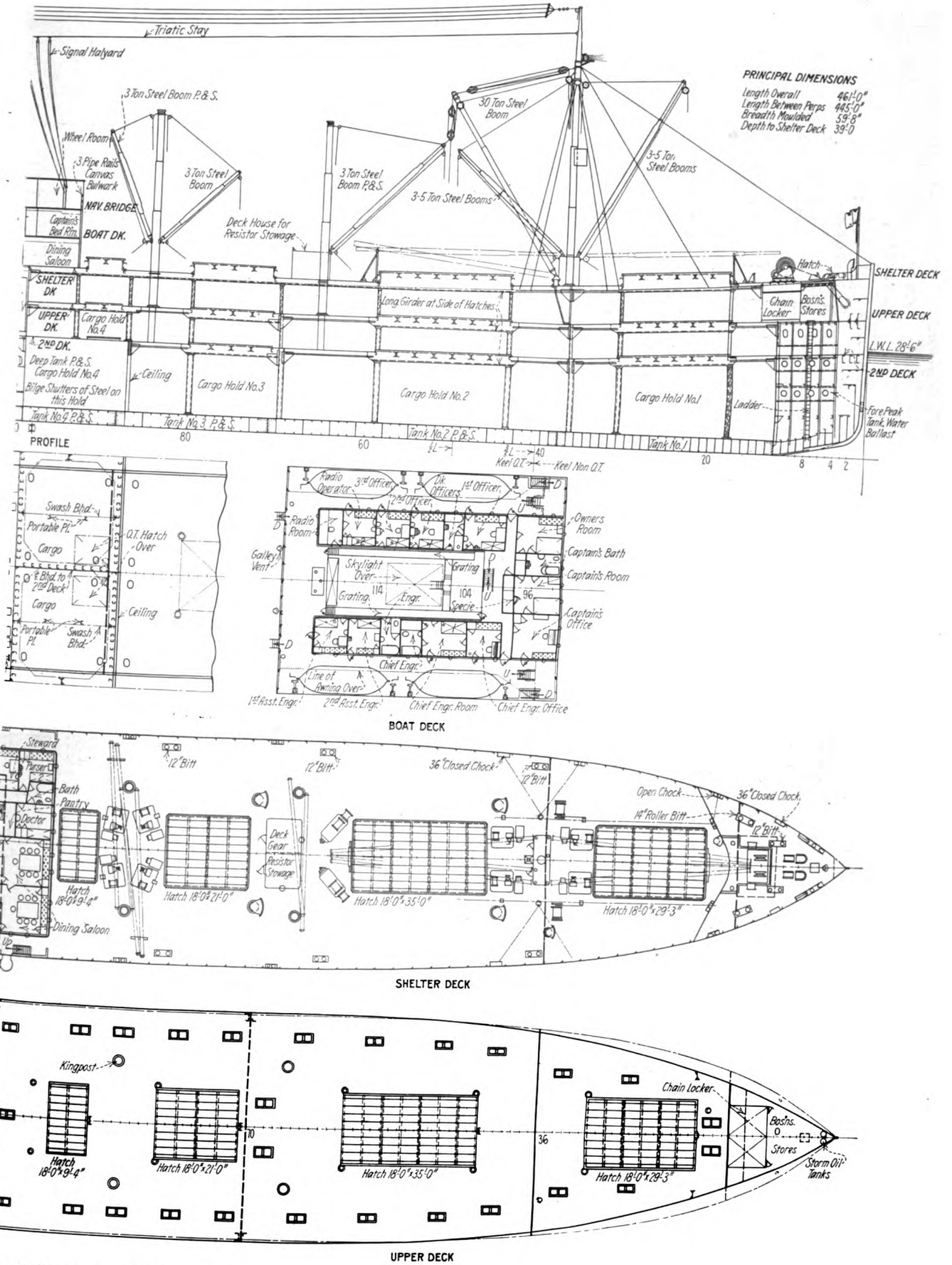


**ships Californian and Missourian**

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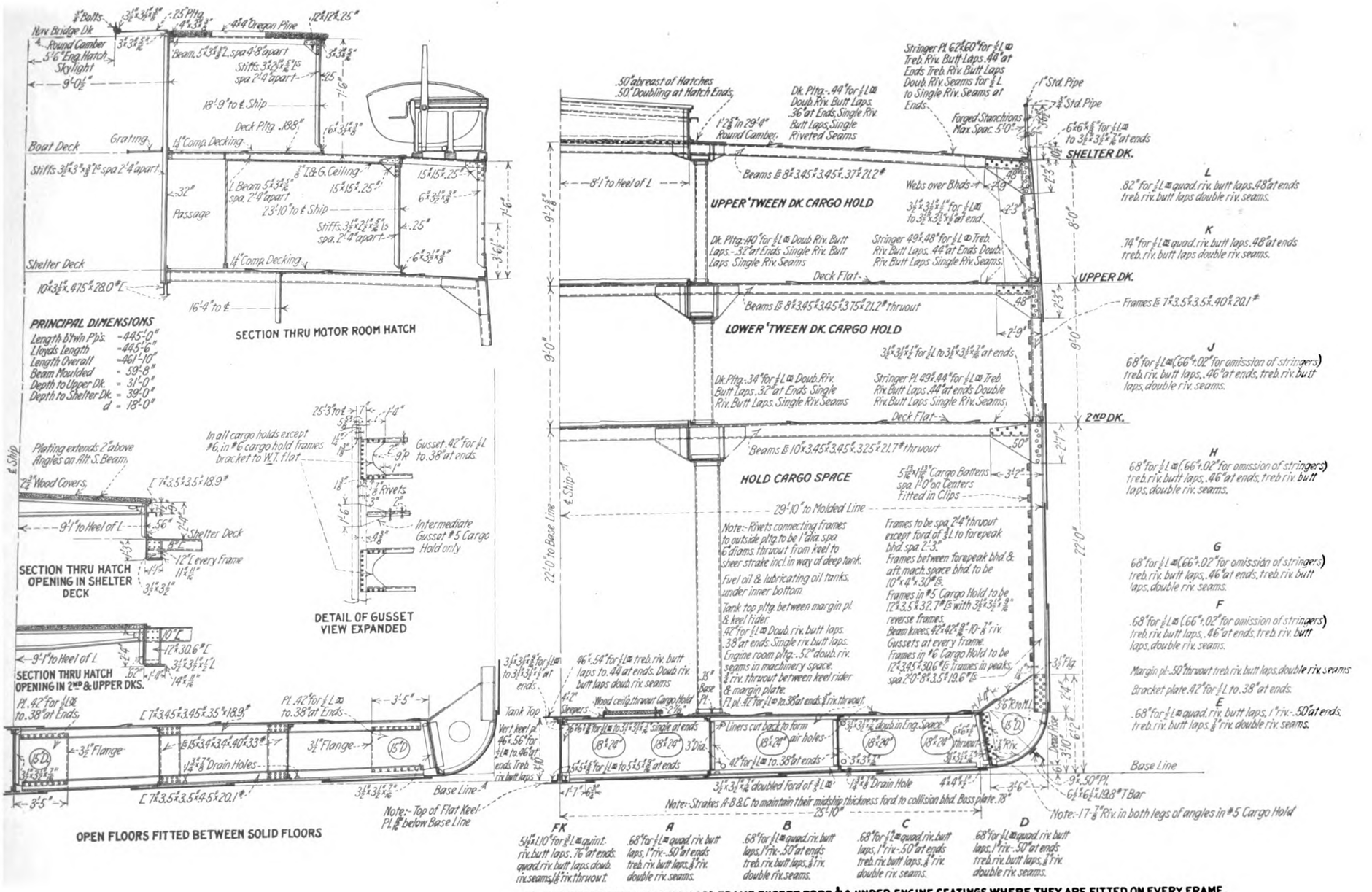
SECTION THRU MOTOR ROOM HATCH
PRINCIPAL DIMENSIONS
Length b'twn Pp's. = 445'-0"
L'loyds Length = 445'-6"
Length Overall = 461'-10"
Beam Moulded = 59'-8"
Depth to Upper Dk. = 31'-0"
Depth to Shelter Dk. = 39'-0"
d = 18'-0"
SECTION THRU HATCH OPENING IN SHELTER DECK
SECTION THRU HATCH OPENING IN 2ND & UPPER DKS.
DETAIL OF GUSSET VIEW EXPANDED
OPEN FLOORS FITTED BETWEEN SOLID FLOORS
UPPER 'TWEEN DK. CARGO HOLD
LOWER 'TWEEN DK. CARGO HOLD
HOLD CARGO SPACE
SHELTER DK.
UPPER DK.
2ND DK.
Base Line
SOLID FLOORS FITTED ON EVERY 3RD FRAME EXCEPT FORD. & UNDER ENGINE SEATINGS WHERE THEY ARE FITTED ON EVERY FRAME.

**Midship Section of Motorships Californian and Missourian**

Original from UNIVERSITY OF MICHIGAN

# New American Motorship Californian and Missourian

## General Information

**Service:** .....General freight .....

**Builders:** Hull: Merchant Shipbuilding Corp., Chester Pa.

**Machinery:** The Wm. Cramp & Sons Ship & Engine Bldg. Co., Phila., Pa., U. S., Licensees of Burmeister & Wain.

**Owner:** The American-Hawaiian Steamship Co.

## Characteristics

Length, overall .....461' 7½"
Length, B. P. .....445' 0"
Breadth, molded ..... 59' 8"
Depth, molded to shelter deck..... 39' 0"
Draft, loaded ..... 28' 6"
Draft, light ..... 10' 7"
Block coefficient .....0.76
Midship section coefficient .....0.986
Longitudinal coefficient .....0.77
Speed, loaded, knots .....11.5
Cruising radius, nautical miles .....25,000
Framing .....Transverse
Class ..... ✠ 100 A.1. Lloyd's

## Tonnages

(In tons of 2,240 pounds)

*Weight of Hull, about .....4,518
**Weight Propelling Machinery, about .982
Deadweight Capacity .....11,000
Displacement .....16,500

(In tons of 100 cubic feet)

Gross register .....
Net register .....

*Weight of Hull includes Hull Proper, Hull Fittings, Equipment, and Outfit.
**Weight of Propelling Machinery includes Engines, Boilers (Wet), Shafting, Propellers, and Machinery Space Auxiliaries.

## Canal Ratings

(In tons of 100 cubic feet)

| | Gross | Net |
|---|---|---|
| Suez ..... | | |
| Panama ..... | | |

## Equipment

2 bower anchors, stockless, each ..8,624 lbs.
1 bower anchor, stockless .....7,336 lbs.
1 stream anchor, stockless .....3,080 lbs.
1 kedge anchor, stockless .....1,400 lbs.
Cable, 2 7/16" stud-chain .....300 fathoms
Streamline, 5" steel wire .....120 fathoms
Towline, 5¾" steel wire .....130 fathoms
4 hawsers, 8" manila, each.....100 fathoms

## Rudder

Area, square feet .....191.4
Diameter Stock, upper..... 12½"
Lower .....12" to 9"
C. Press. abaft C. L. pintles, feet .....3.6

## Complement

Deck officers ..... 4
Deck crew .....14
Engineer officers ..... 5
Engineer crew ..... 9
Purser's and steward's department ..... 7

Total officers and crew .....39
First-class passengers } 3 spare rooms with
Second-class passengers } accommodations
Third-class passengers } for 5 persons
Total complement .....44

## Handling Equipment

| | No. | Type | Capacity | Length |
|---|---|---|---|---|
| Masts ..... | 2 | pole | ... | fore 78' 0" / main 79' 0" |
| Derrick posts | 6 | steel | .... | 41' 0" |
| Booms..... | 1 | steel | 30 ton | 55' 0" |
| | 1 | steel | 10 ton | 55' 0" |
| | 11 | steel | 5 ton | 55' 0" |
| | 8 | steel | 3 ton | 44' 1" |

## Deck Machinery

Steering gear....Hyde windlass, Heleshaw, electric hydraulic type
Windlass..electric spur geared type, 75 H.P. motor.
Capstans.....(1) electric, reversible type
Winches....(16) 18x18 drum and (1) 18" gypsy head, driven by 30 H.P. electric motors.

## Life Saving Equipment

| | No. | Capacity | Length |
|---|---|---|---|
| Lifeboats ..... | 3 | 30 persons | 24' 0" |
| Motorboat ..... | 1 | ..... | 24' 0" |

## Propelling Machinery

### Main Diesel Engines

Number .....2
Type .....Cramp, B & W, 4 cycle
Size.....29⅛" dia. x 45¼" stroke
No. cylinders, each engine.....6
R. P. M., designed.....115
I. H. P., total.....4,500

### Auxiliary Diesel Engines

Number, (4) each direct connected to Diehl generators.
Type .....Cramp, B & W, 4 cycle
Size .....12¾" diam. x 13¾" stroke
No. cylinders, each engine.....2
R. P. M. .....300
B. H. P., each .....100

### Donkey Boiler

Number .....1
Type .....vertical firetube
Size.....48" int. dia., 9' 0" high
Fuel .....oil
Heating surface, sq. ft.....400
Working pressure, lbs. per sq. in.....150

### Propellers

Number .....2
Type.....solid mang. bronze, 4 blades
Weight .....
Diameter .....13' 6"
Pitch .....11' 9"
R. P. M.....115
Projected area, sq. ft.....51.1
Developed area, sq. ft.....59.35

## Auxiliary Machinery

### Machinery Space

Maneuvering compressor..(1) motor driven
Auxiliary compressor.....(1) steam driven
(1) F. W. cooler
Evaporators..(1) 500 gal. per day capacity
Distiller.....(1) 500 gal. per day capacity
Filters .....
Feed water heater.....
Fuel oil heaters.....
Pumps .....
(3) S. W. cooling, centrif., motor dr.
(1) F. W. cooling, centrif., motor dr.
(2) Sanitary-bilge, plunger type, motor dr.
(1) Ballast, rotary, wing type, motor dr.
(1) Fuel transfer, rotary wing type, motor dr.
(2) Lub. oil, rotary gear type, motor dr.
(1) Fuel transfer, rotary gear type, motor dr.
(1) F. W. service, rotary gear type, motor dr.
(1) Donkey blr. fuel, 3 x 2 x 3 steam
(1) Donkey blr. feed, 5 x 3¼ x 5 steam
(1) Evap. feed, 3 x 3 x 3 steam

### Refrigerating Machinery

Brunswick ammonia, direct expansion type, 2 tons capacity
.....

### Electric Equipment

Generators:
(4) 65 K.W. connect. to aux. Diesel eng.
(1) 20 K.W. motor generator set
Radio.....2 K.W. outfit
Emergency..(1) 15 K.W. kerosene engine driven lighting set

## Holds

| No. | Length | Hatches |
|---|---|---|
| 1 .. | 56' 3" | 18' 0"x29' 3" |
| 2 .. | 76' 8" | 18' 0"x35' 0" |
| 3 .. | 39' 8" | 18' 0"x21' 0" |
| 4 .. | 28' 0" | 18' 0"x9' 4" |
| 5 .. | 72' 4" | (1) 18'x11' 8" (1) 18' 0"x28' 0" |
| 6 .. | 67' 8" | 18' 0"x28' 0" |

## Capacities

### Cargo Space

| Compartment | Cu. ft. Grain | Bales |
|---|---|---|
| Upper 'tween deck | | |
| Hold No. 1 ..... | 22,896 | 19,840 |
| " " 2 ..... | 79,181 | 70,864 |
| " " 5 ..... | 43,753 | 38,928 |
| " " 6 ..... | 33,745 | 30,032 |
| Lower 'tween deck | | |
| Hold No. 1 ..... | 19,584 | 16,400 |
| " " 2 ..... | 39,211 | 34,400 |
| " " 3 ..... | 35,923 | 31,712 |
| Hold No. 1 ..... | 41,656 | 36,576 |
| " " 2 ..... | 77,486 | 70,544 |
| " " 3 ..... | 40,007 | 36,918 |
| " " 5 ..... | 110,634 | 100,592 |
| " " 6 ..... | 54,416 | 46,481 |
| Total ..... | 598,492 | 533,287 |

### Refrigerated Space

| Compartment | Cu Ft. |
|---|---|
| Meat room .....683 | |
| Provisions .....594 | |
| Total .....1,277 | |

### Fuel Oil Tanks

| Compartment | Cu. Ft. | *Tons |
|---|---|---|
| I. B. tank No. 1..... | 5,132 | 135.05 |
| " " " 2 P. & S... | 13,091 | 344.50 |
| " " " 3 " ... | 7,401 | 194.76 |
| " " " 4 " ... | 5,219 | 137.34 |
| " " " 5 " ... | 9,314 | 245.11 |
| " " " 6 " ... | 8,992 | 236.63 |
| " " " 7 " ... | 3,127 | 84.66 |
| Settling tank ..... | 2,086 | 54.89 |
| Daily supply tank..... | 837 | 22.02 |
| Total .....55,199 | | 1454.96 |

*38 cu. ft. per ton;.....gals. per bbl.

### Tanks

| Compartment | Cu. Ft. | Tons F.W. | Tons S.W. |
|---|---|---|---|
| F. W. tanks (2)..... | 846 | 23.50 | ..... |
| Aft. peak ..... | 6,474 | 184.97 | ..... |
| Gravity ..... | 13.4 | .37 | ..... |
| I. B. tank No. 1..... | 5,132 | .... | 146.62 |
| I. B. tank No. 2, P. & S. | 13,091 | .... | 374.03 |
| I. B. tank No. 3, P. & S. | 7,401 | .... | 211.46 |
| I. B. tank No. 4, P. & S. | 5,219 | .... | 149.10 |
| I. B. tank No. 5, P. & S. | 9,314 | .... | 266.11 |
| I. B. tank No. 6, P. & S. | 8,992 | .... | 256.91 |
| I. B. tank No. 7, P. & S. | 3,127 | .... | 89.34 |
| Deep tank ..... | 30,610 | .... | 874.57 |
| Settling tank ..... | 2,086 | .... | 59.60 |
| Cofferdam ..... | 798 | .... | 22.80 |
| Lub. oil tank..... | 586 | .... | 16.74 |
| Fore Peak..... | 8,101 | .... | 231.46 |
| Total .....101,790.4 | | 208.84 | 2,698.74 |



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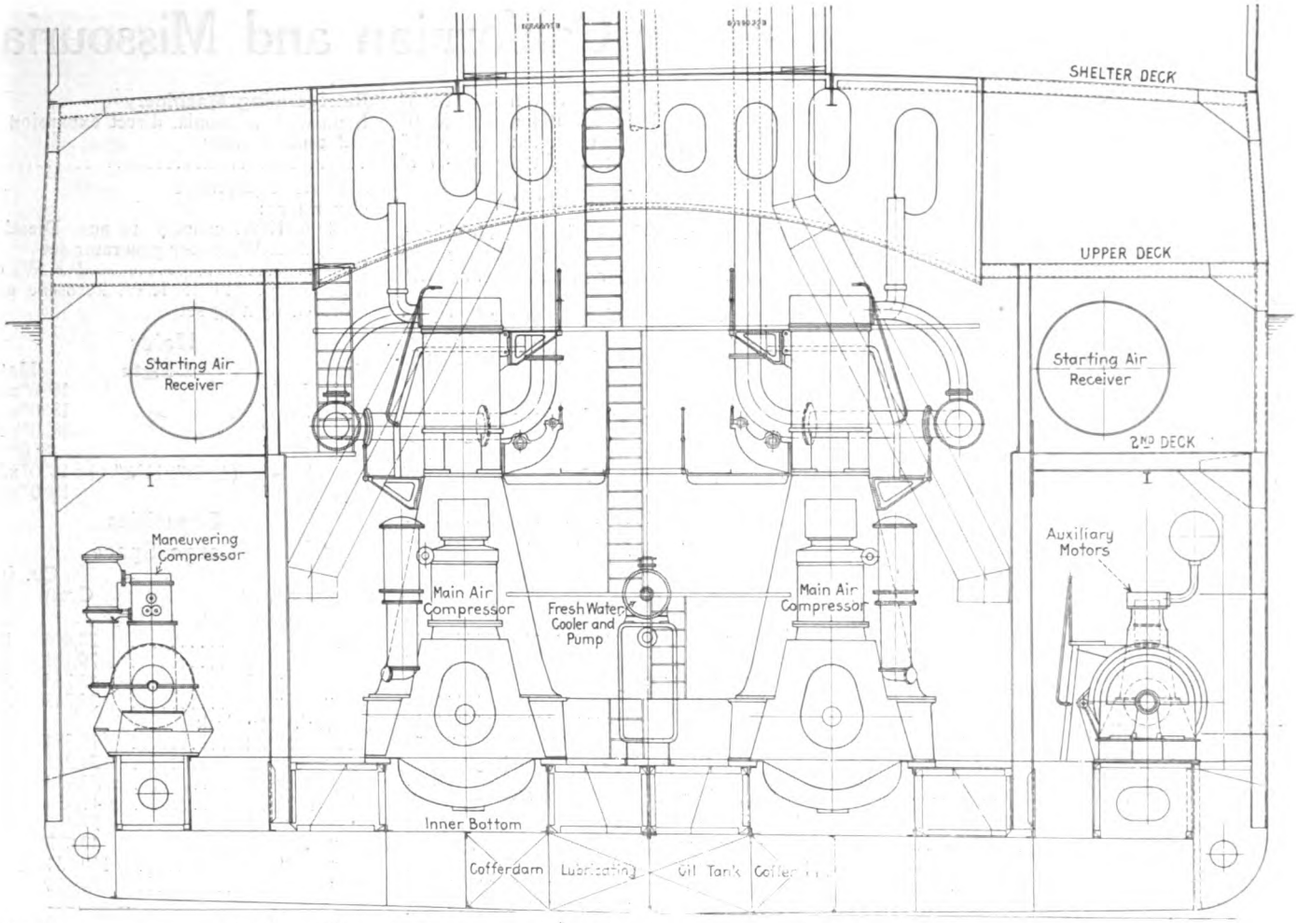


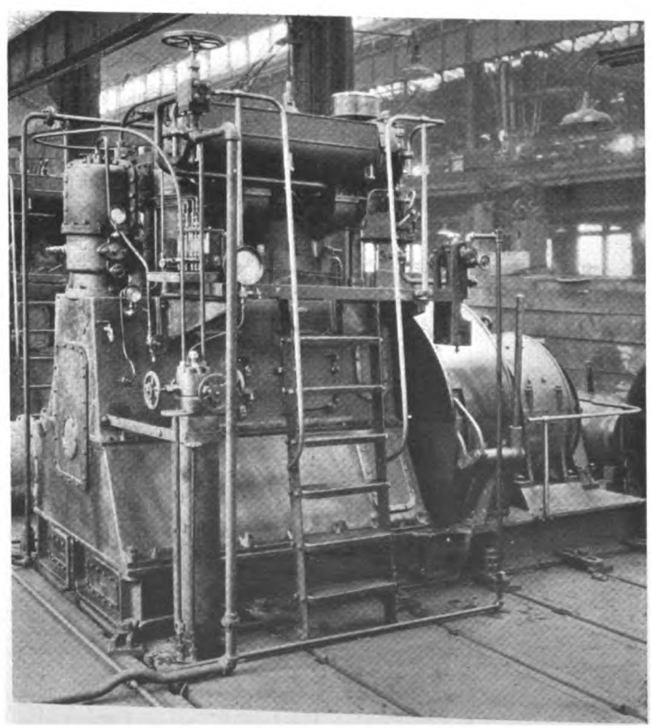

**Section Through Machinery Space of Motorships Californian and Missourian**

to cooling the thrust bearings, guides and pistons and part to the fresh water cooler from which it is discharged overboard by way of the jackets surrounding the exhaust manifolds. A fresh water closed cooling system is employed for the main engine jackets and cylinder covers, which arrangement has been recently adopted for deep draft vessels to guard against getting mud or sand into the system when navigating in rivers or passing through shallow waters. The circulating pump for circulating the fresh cooling water is located on top of the fresh water cooler.

Two sets of lubricating oil pumps are provided for supplying oil under pressure to the main engines, one set being in operation at a time. Each consists of two gear type pumps driven by a common motor and so arranged that each supplies oil independently to one of the engines. The oil drains from the main engines to two separate settling tanks, built into the double bottom of the ship, from which the pumps draw, discharging through strainers to the pressure lubricating systems.

A fuel oil transfer pump, also of the gear type, is used for general oil transfer purposes and for pumping up the daily supply tanks. These latter, which in addition act as settling tanks, are placed on a platform on the forward engine room bulkhead and are of sufficient capacity each for 12 hours running. A small tank is used for a lighter grade of oil for starting up and closing down the auxiliary engines should the main supply be fairly heavy.

A two-stage air compressor, driven by a 120 horsepower motor, and operated when maneuvering is to be done, delivers air at 350 pounds pressure to the starting air receivers located on the port and starboard sides. This compressor also takes the place of a reserve compressor should one of the main engine compressors be out of commission. In such an event the high pressure cylinder of the main engine compressor not disabled draws air from the starting air system and supplies injection air to both engines. The usual losses



**One of the Auxiliary Engines**

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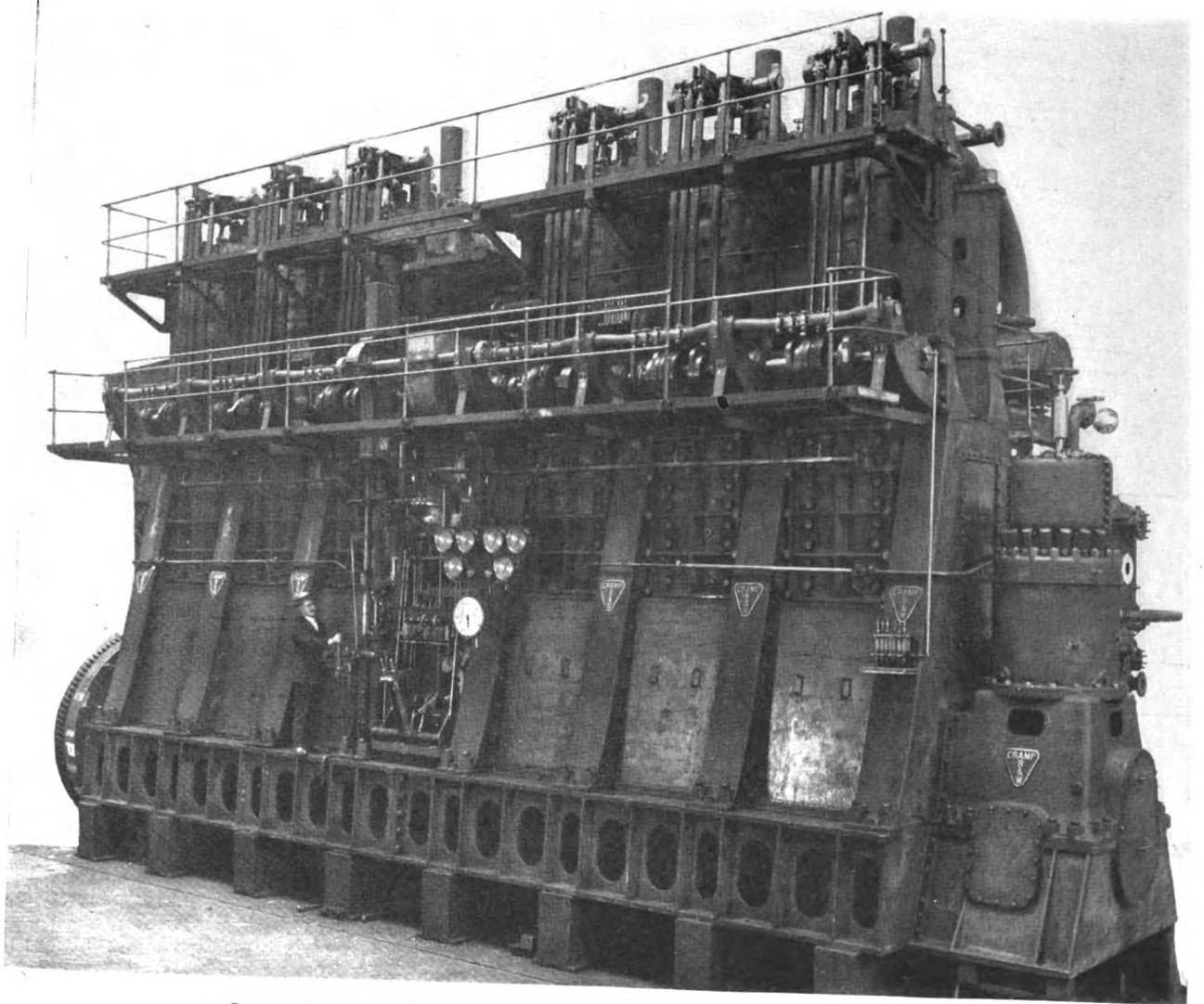

One of the Main Diesel Propelling Engines of the New American Motorships

in maneuvering air when at sea are made up by air taken from the main engine compressors. There is also a small steam driven compressor for pumping up one of the auxiliary engine air bottles when the vessel is new, or should all air on board be lost accidentally.

Two three-throw plunger pumps are for sanitary and fire, general bilge service and for removing the piston cooling water which is dropped into a well in the engine bilge after being discharged from the pistons. One pump is kept as a spare, except in case of fire, when both are employed.

The ballast pump is of the wing type with a capacity of 150 tons per hour.

A small donkey boiler of the fire tube type with 400 square feet of heating surface is installed in the thrust recess for furnishing steam for heating, for operating the small reserve compressor and for fire extinguishing purposes. A $CO_2$ smothering system is also installed and arranged to work in common with the steam system.

A motor generator set of 20 kilowatts capacity changes the 220 volts to 110 volts for lighting purposes. A 15-kilowatt kerosene engine driven lighting set is installed on the main deck as a reserve lighting set and for operating in port when it is desired to close down the engine room completely.

Provision is made in the silencer house for heating salt and fresh water for sanitary purposes from the exhaust gases from the main engines.

### WEIGHT OF MACHINERY

The total weight of the two main engines with flywheel, attached piping, grating and exhaust manifolds is 543 tons. The total weight of machinery within the engine room, including shafting, etc., and deck silencers, with water but excluding hull engineering piping, etc., is 932 tons.

The contract speed of the vessels is 11.5 knots loaded, though it is anticipated that 12 knots will easily be made, which is to be assumed from the performance of similar sized foreign vessels having similar block coefficients and the same size engines.

No effort has been spared in obtaining for these ships the best in workmanship and material, and in the selection of auxiliaries, so that when they go into service it is expected that they will rank with the best freighters in the world in economy and reliability.

The size and tonnage of these motorships are the outstanding features for economical service and they are considered the most acceptable type for the establishment and maintenance of long distance voyages for combined cargo-passenger trade routes.

It is encouraging to note that American shipowners are beginning to appreciate the economy of motorships for long voyages and are taking steps to place the American merchant marine in a position to meet foreign competition in this respect.

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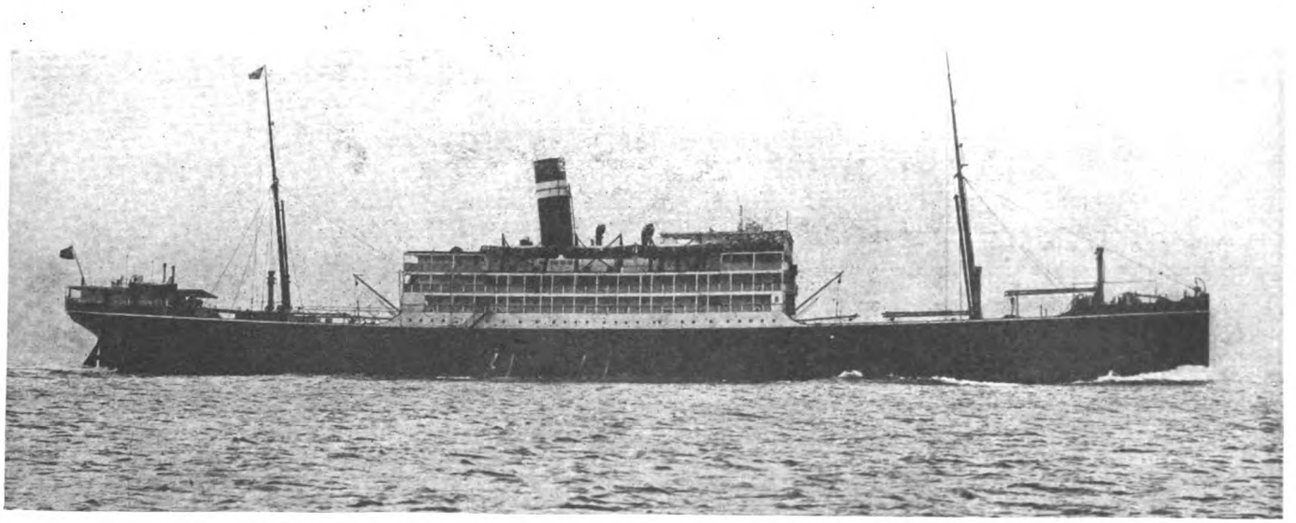

**The Motor Liner Domala, of 11,000 Tons Deadweight Carrying Capacity and 13¾ Knots Speed**

# Motor Passenger Liner Domala

## First Oil Engined Vessel Specially Designed for Carrying Passengers—Radius of Action Over 13,000 Miles

**By Our Special London Correspondent**

ALTHOUGH the motor ship *Aba,* which sailed on her maiden voyage in November, was the first passenger liner equipped with internal combustion engines, she was not originally constructed for this purpose and was, in effect, a converted cargo ship. The *Domala,* however, which left London on December 30 for her first trip, was designed in the first instance as a passenger liner. As she is the first ship built for the British India Steam Navigation Company, her completion has aroused enormous interest. This firm owns some 50 steamers, and is affiliated with the Peninsular and Oriental Steam Navigation Company. It may therefore reasonably be anticipated that, if the *Domala* proves successful in service, she will be followed by still larger motor mail liners on the Peninsular and Oriental service between London and India.

### Popular Line With Passengers and Shippers

The *Domala,* except for her machinery, is similar in design and appearance to a number of steamers built for the same owners. These have always proved extremely popular vessels, both with passengers and shippers, as the voyage from London to Bombay takes only a few days longer than the mail steamer, while the price is £10 lower. Passenger accommodation is all amidships, comprising cabins for 41 second class and 85 first class passengers, although arrangements are made by which some of the two berthed first class rooms can be turned into three berthed second class, if desired, increasing the total passenger accommodation to about 140. The engine room is arranged amidships and it is a proof of the quietness and absence of vibration of modern Diesel machinery that the passenger accommodation is all above the machinery, which would not have been allowable were vibration or noise excessive.

### Larger Deadweight Carrying Capacity

The total length of the engine room exclusive of the thrust recess is 56 feet and, although, owing to the adoption of the four cycle system, the engines are large and heavy, the overall length occupied is less than that required in a corresponding reciprocating steam engined vessel including the boilers and cross bunkers. The actual machinery weighs approximately the same as a steam plant of similar power, but a considerable additional space is available for cargo, as the fuel oil is carried in tanks in the double bottom, forward of the engine room. For a given radius of action (which is over 13,000 miles in the case of the *Domala*) the weight of oil required is one quarter of that in a coal fired steamer, so that the deadweight capacity of the motorship is larger.

### Electro Hydraulic Winches

Of the six holds, varying in length from 49 feet 6 inches to 60 feet 6 inches, three are arranged forward, and three aft of the engine room, served by 12 three-ton winches of the electro hydraulic type. Winches of this class are very uncommon, the advantage claimed being that any speed of lifting is possible from the maximum to a "creep," and that the control is much better than is possible with electric winches provided with ordinary contactor switches. They are of the Williams Janney design, the same principle that is now frequently adopted for electric hydraulic steering gears. It involves a hydraulic pump which is driven by an electric motor. The whole of the control of the winch is effected on the pump itself so that the motor operates continuously.

These winches are more expensive to install than the direct gear driven type but the manufacturers state that the cost of upkeep is less, the consumption smaller and they are simpler to manipulate by the natives who operate the cargo handling appliances on the eastern run. There are six hatches each provided with two winches.

### Construction of Hull

The hull of the *Domala* was built by Barclay Curle and Company, Limited, on the Clyde, and has the following dimensions: Length overall, 465 feet; length between per-



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MAP








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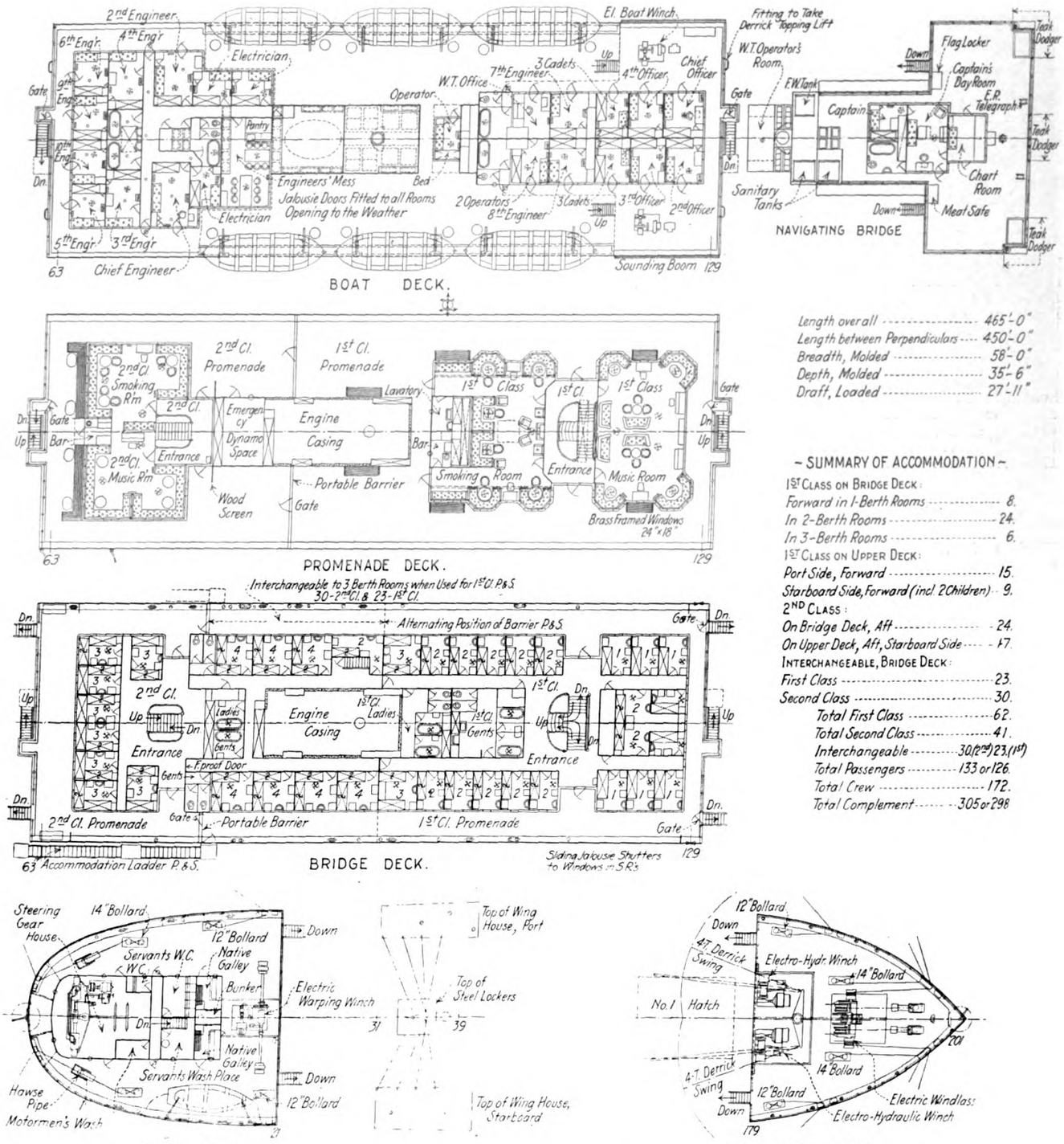
BOAT DECK.
NAVIGATING BRIDGE
PROMENADE DECK.
BRIDGE DECK.
POOP DECK.
FORECASTLE DECK.
Length over all ---- 465'-0"
Length between Perpendiculars ---- 450'-0"
Breadth, Molded ---- 58'-0"
Depth, Molded ---- 35'-6"
Draft, Loaded ---- 27'-11"
~ SUMMARY OF ACCOMMODATION ~
1ST CLASS ON BRIDGE DECK:
Forward in 1-Berth Rooms ---- 8.
In 2-Berth Rooms ---- 24.
In 3-Berth Rooms ---- 6.
1ST CLASS ON UPPER DECK:
Port Side, Forward ---- 15.
Starboard Side, Forward (incl. 2 Children) ---- 9.
2ND CLASS:
On Bridge Deck, Aft ---- 24.
On Upper Deck, Aft, Starboard Side ---- 17.
INTERCHANGEABLE, BRIDGE DECK:
First Class ---- 23.
Second Class ---- 30.
Total First Class ---- 62.
Total Second Class ---- 41.
Interchangeable ---- 30 (2nd) 23 (1st)
Total Passengers ---- 133 or 126.
Total Crew ---- 172.
Total Complement ---- 305 or 298

**Upper Deck Plans of Motorship Domala**

pendiculars, 450 feet; breadth molded, 58 feet; depth molded, 35 feet 6 inches; draft, 27 feet 11 inches. The gross tonnage is just under 9,000 and the deadweight capacity about 11,000 tons.

A large proportion of the crew, which totals 172 people, is composed of natives, quartered in the poop, while the European petty officers have cabins in the forecastle. Lord Inchcape who is chairman of the British India Steam Navigation Company, holds strongly to the view that engineers and deck officers should have the best possible accommodation and moreover that they should be located on the same deck. In the *Domala*, therefore, both the engineers and the navigating officers are berthed on the boat deck, the former at the after end and the latter forward, a separate room being provided for each deck officer. It is to be noted that by this system, the engineers and deck officers have a large space for recreation purposes, exclusive of the passenger deck.

### MAIN DECK ARRANGEMENT

On the main deck, aft of the engine room, are various refrigerated chambers cooled on the carbon dioxide system and, in addition, the baggage room, linen locker and stores for other purposes. On the upper deck immediately above are a number of first and second class cabins, with the first

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# Motor Passenger Liner Domala

## General Information

**Service:** England-India Freight and Passenger .....

**Builder:** Barclay Curle & Co., Ltd., Whiteinch, Glasgow .....

**Owner:** British India S. N. Co., Ltd., London .....

## Characteristics

Length, overall .....465'-0"
Length, B. P. .....450'-0"
Breadth, molded .....58'-0"
Depth, molded .....35'-6"
Draft, loaded .....27'-11"
Draft, light .....
Block coefficient .....
Midship section coefficient.....
Longitudinal cofficient .....
Speed, loaded, knots.....13.5
Cruising radius, nautical miles.....13,300
Framing ..... Transverse
Class .....100 A.1. Lloyds

## Tonnages

(In tons of 2,240 pounds)

*Weight of Hull.....
**Weight Propelling Machinery.....
Deadweight Capacity, approx.....11,000

### Displacement

(In tons of 100 cubic feet)

Gross register, about.....9,000
Net register .....5,200

*Weight of Hull includes Hull Proper, Hull Fittings, Equipment, and Outfit.
**Weight of Propelling Machinery includes Engines, Boilers (Wet), Shafting, Propellers, and Machinery Space Auxiliaries.

## Canal Ratings

(In tons of 100 cubic feet)

| | Gross | Net |
|---|---|---|
| Suez<br>Panama | Not yet available. | |

## Equipment

Anchors } .....to Lloyd's Rules
Chain }

## Rudder

Area .....
Dia. Stock .....
C. Press. abaft C. L. pintles.....

## Complement

| | |
|---|---|
| Deck officers ..... | 5 |
| Deck crew ..... | 49 |
| Wireless operators ..... | 3 |
| Engineer officers ..... | 13 |
| Engineer crew ..... | 24 |
| Purser's and steward's department.... | 78 |
| Total officers and crew..... | 172 |
| First-class passengers ..... | 62 |
| Second-class passengers ..... | 41 |
| Interchangeable...30 (2nd cl.) or 23 (1st cl.) | |
| Total passengers.....133 or 126 | |
| Total complement.....305 or 298 | |

## Handling Equipment

| | No. | Type | Capacity | Length |
|---|---|---|---|---|
| Masts ..... | 2 | Pole | .... | .... |
| Derrick posts. | 5 | | .... | .... |
| Booms .....12 | | | 4-ton | .... |
| Booms ..... | 1 | | 15-ton | .... |
| Booms ..... | 1 | | 30-ton | .... |

## Deck Machinery

Steering Gear.....Hele Shaw, electric type
Windlass.....(1) electric
Capstans ..... None
Winches .....(13) electro-hydraulic

## Life Saving Equipment

| | No. | Capacity | Length |
|---|---|---|---|
| Lifeboats .. | 2 | 60 persons | 30'-0" |
| Lifeboats .. | 4 | 50 persons | 28'-0" |
| Dinghy .... | 1 | | 20'-0" |

## Donkey Boilers

Number ..... 1
Type .....vertical
Length .....
Width or Diameter.....
Furnaces .....
Fuel .....Oil
Draft .....
Total heating surface, square feet.....220
Total grate surface or furnace volume.....
Superheat, degrees F.....
Working pressure, lbs. per sq. in.....100

Normal fuel consumption:
Per day, tons.....1.00
Per horsepower hour, pounds.....

Normal steam production:
Per hour per pound of fuel.....lbs.
Total per hour.....lbs.

## Propelling Engines

Number ..... 2
Type .....North British Diesel
Size .....8 cylinders, 26.5" x 47"
Horsepower, total indicated.....4,660

## Propellers

Number ..... 2
Type ..... 4 bladed
Weight .....
Diameter .....
Pitch .....
R. P. M. .....
Projected area .....
Developed area .....

## Auxiliary Machinery

### Machinery Space

Air Compressors (2) Diesel-driven.
(2) Aux. air compressors.
(1) Steam-driven air compressor.
Evaporators (1) 3,000 gals. per 24 hrs.
Distiller (1) 3,000 gals. per 24 hrs.
(1) F. O. Plant for donkey boiler.
(1) Silencer.
(1) Oil cooler.
(1) DeLaval oil separator.
(1) Clayton fire ext. machine.
(6) Portable fire exting'rs.
(6) Foamite firefoam exting'rs.
(1) Exh. heat boiler.
(1) Exh. heat boiler injector.
(1) Blake boiler injector.

### Pumps

(1) 30" Sirocco fan.
(1) Ballast.
(2) Lubricating oil.
(1) Daily service fuel oil.
(2) Cylinder cooling water.
(2) Bilge.
(1) Piston cooling water.
(1) Cold sanitary.
(1) Hot sanitary.
(1) Donkey feed.
(1) Emergency bilge.
(1) Hand lubricating oil.
(1) Hand F. O. drain.

### Refrigerating Machinery

Haslam electrically-driven
C $O_2$ machine.

### Electric Equipment

Generators:
(2) 215 K. W. units.
(1) Tuxham engine, dynamo and tanks.
Emergency 16 K. W. unit.

## Holds

| No. | Length | Hatches |
|---|---|---|
| 1 ..... | 60'-6" | 22'-6" x 18'-0" |
| 2 ..... | 54'-0" | 27'-0" x 18'-0" |
| 3 ..... | 74'-6" | 29'-3" x 18'-0" |
| 4 ..... | 61'-0" | 22'-6" x 18'-0" |
| 5 ..... | 49'-6" | 22'-6" x 18'-0" |
| 6 ..... | 54'-0" | 22'-6" x 18'-0" |

## Capacities

## Cargo Space

| Compartment | |
|---|---|
| ..... | |
| ..... | |
| ..... | |
| ..... | |
| ..... | |
| ..... | |
| ..... | |
| ..... | |
| ..... | |
| ..... | |
| ..... | |
| ..... | |
| ..... | |
| ..... | |

## Refrigerated Space

| Compartment | Cu. Ft. |
|---|---|
| ..... | |
| ..... | |
| ..... | |
| ..... | |
| ..... | |
| ..... | |
| ..... | |

## Bunkers

| Compartment | Cu. Ft. | *Bbls. | *Tons |
|---|---|---|---|
| Oil fuel in double bottom in four tanks. | | | |
| ..... | | | |
| ..... | | | |
| ..... | | | |
| ..... | | | |
| ..... | | | |
| ..... | | | |
| ..... | | | |
| ..... | | | |

*....cu. ft. per ton;.....gals. per bbl.

## Tanks

| Compartment | Cu. Ft. | Tons F. W. | Tons S. W. |
|---|---|---|---|
| ..... | | | |
| ..... | | | |
| ..... | | | |
| ..... | | | |
| ..... | | | |
| ..... | | | |
| ..... | | | |
| ..... | | | |
| ..... | | | |
| ..... | | | |
| ..... | | | |
| Total | | | |



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class dining saloon at one end and that for the second class at the other. In both cases, seating accommodation is provided for more than the full complement of passengers, mainly at small tables.

All of the cabins, on this and the other decks, are provided with a port hole. An examination of the plans will show that in the case of the interior cabin this has been carried out in a very ingenious manner by leaving a passageway between the two outer cabins. In this way, a certain amount of space is lost but there is undoubtedly an overwhelming advantage in its favor. The system was introduced by Lord Inchcape and a somewhat similar method is adopted on certain other British passenger liners.

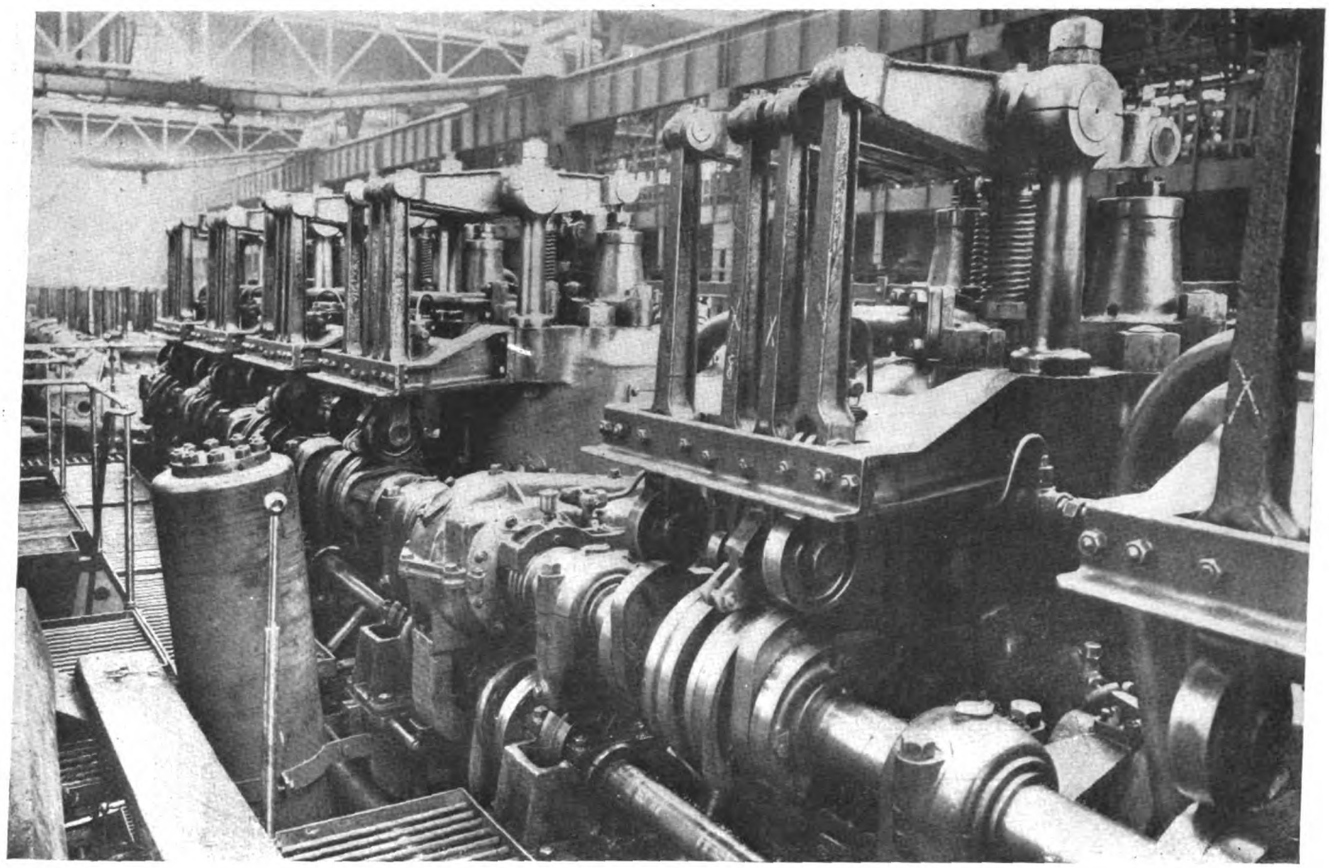
### GALLEY FEATURES

The galley is situated on the main deck aft of the engine casing. An interesting feature is that there is a passageway from the galley to the dining saloon inside the main passageway so that the movement of the passengers is not impeded by the dining saloon attendants. This again means a certain loss of space but it has obvious advantages. The dining saloons and other public rooms are heated by electric radiators but the galley is coal fired, while hot water for the boiling vessels, etc., is supplied from a donkey boiler in the engine room.

Above the main deck is the bridge deck with further passenger accommodation, many of the cabins at the forward end being provided with a single bed. Above this is the promenade deck, with the first class entrance dividing the music saloon from the smoking room, while at the after end of the same deck is the second class smoking room and the music room. The boat deck, as previously mentioned, has accommodation for the officers and engineers. Above the navigating bridge are the captain's dayroom and bedroom. All of the cabins are provided with running water with overboard discharge, a convenience realized only by the experienced traveller. An electric fan is fitted in each room, large ceiling fans being provided in the public rooms.

### MACHINERY INSTALLATION

The machinery installation represents the first of its class that has yet been installed in any vessel and is a twin screw plant developing a total of 4,000 brake horsepower, which on trials gave the vessel a speed of 13¾ knots. It was built by the North British Diesel Engine Works in Glasgow and each engine has eight cylinders, 26½ inches diameter and 47 inches stroke. When running at 96 revolutions per minute the full power (which is equivalent to about 2,350 indicated horsepower) is developed, but it is to be noted that although the engines are of the usual air injection type, they do not drive their own air blast compressors.



**Top of One of the 2,000 Brake Horsepower Engines of the Domala, Showing Valve Operating and Reversing Mechanism**

### NEW DESIGN FEATURES

Each engine is some 44 feet in length overall and arranged in two groups of four cylinders, with the reversing mechanism in the center. Apart from the Burmeister and Wain and Worthington types, no four cycle Diesel marine motors of larger size have yet been constructed and in the design one or two novel features have been introduced. On the top of the cast iron frames, which do not take the cylinder stresses, is carried an entablature which supports the cylinders. Long vertical steel columns pass from the bedplate to the top of this entablature and relieve the framing of the stresses, the construction in this respect being somewhat similar to that employed with the newest Burmeister and Wain engine.

A marked difference is, however, to be noted in the valve

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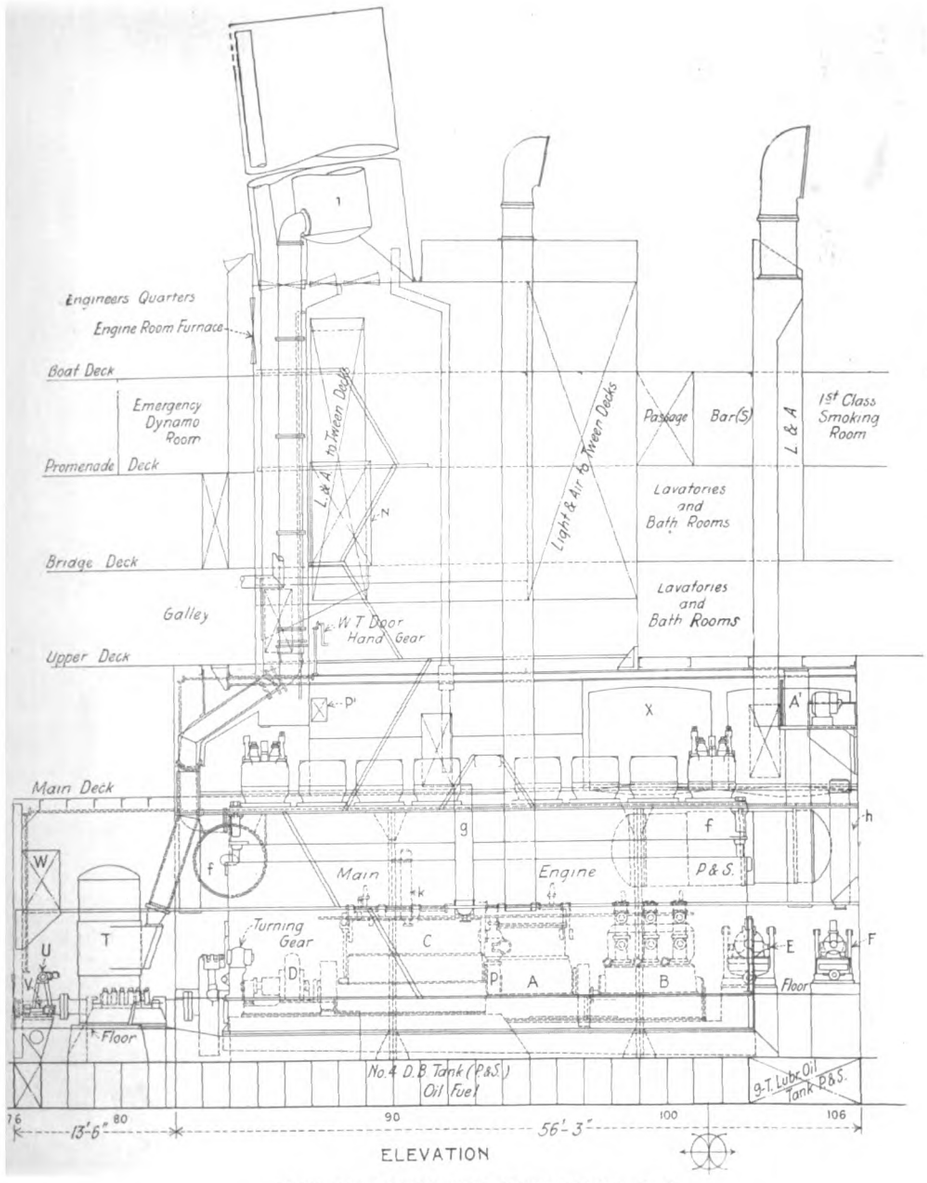


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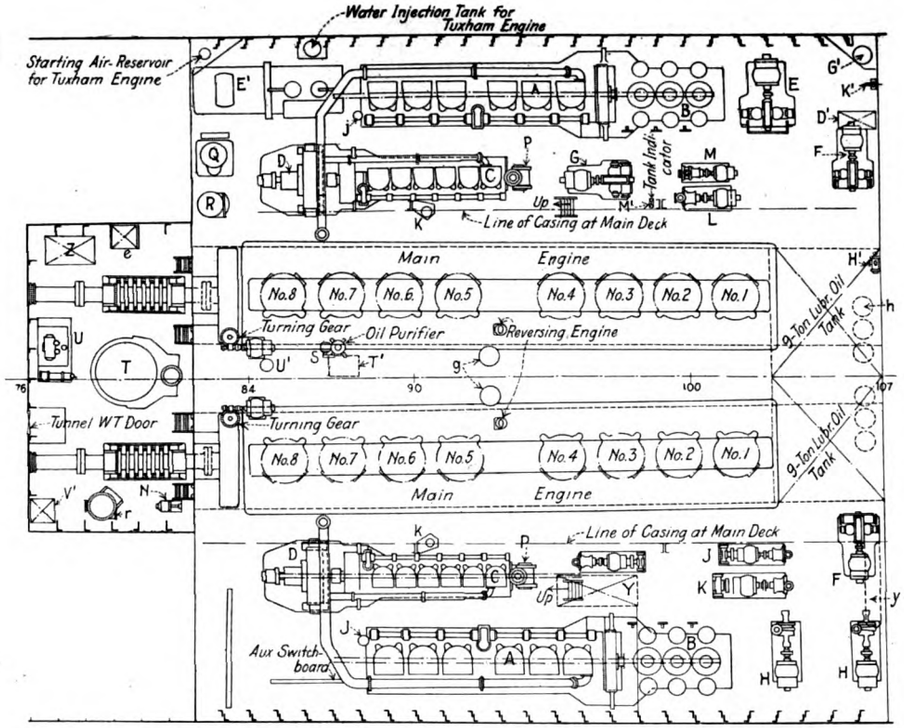


PLAN

LIST OF AUXILIARY MACHINERY, ETC.

| Mark | No. | Description | Size |
|---|---|---|---|
| A | 2 | Compressor engine | 6 cyl., 15" dia. by 17¾" stk. |
| B | 2 | Main air compressor | 1,000 cu. ft. per min. |
| C | 2 | Dynamo engine | 6 cyl., 11½" dia. by 14½" stk. |
| D | 2 | Dynamo | 215 k.w. |

List of Auxiliary Machinery, etc., Continued.

| Mark | No. | Description | Size |
|---|---|---|---|
| E | 1 | Ballast pump | 100 tons per hr. |
| F | 2 | Lubricating oil pump | 50 tons per hr. |
| G | 1 | Daily service o. f. pump | 50 tons per hr. |
| H | 2 | Cyl. cooling water pump | 150 tons per hr. |
| J | 2 | Bilge pump | 50 tons per hr. |
| K | 1 | Piston cooling water pump | 100 tons per hr. |
| L | 1 | Cold sanitary pump | 80 tons per hr. |
| M | 1 | Hot sanitary pump | 30 tons per hr. |
| N | 1 | Fresh water pump | 10 tons per hr. |
| P | 2 | Aux. air compressor | ..... |
| O | 1 | Steam air compressor | 60 cu. ft. per min. |
| R | 1 | Evaporator | 3,000 gals. per 24 hrs. |
| S | 1 | Distiller | 3,000 gals. per 24 hrs. |
| T | 1 | Donkey boiler | H. S. = 220; W. P. = 100 lbs. per sq. in. |
| U | 1 | Donkey boiler o. f. plant | ..... |
| V | 1 | Donkey boiler feed pump | ..... |
| W | 1 | Donkey boiler feed tank | 2 tons |
| X | 2 | Daily service o. f. tanks | 14 tons each |
| Y | 1 | Piston cooling water tank | 2 tons |
| Z | 1 | Reserve lub. oil tank | 1½ tons |
| a | 3 | Eng. oil tanks | 80 gals. each |
| b | 2 | Cyl. oil tanks | 80 gals. each |
| d | 1 | Colza oil tanks | 80 gals. |
| e | 1 | Paraffin oil tanks | 80 gals. |
| f | 4 | Starting air receivers | 1,510 cu. ft. (total) |
| g | 2 | Main eng. air bottles (working) | 17" ex. dia. by 134" long |
| h | 6 | Reserve air bottles | 19" ex. dia. by 127" long |
| j | 2 | Compressor eng. air bottles | 10½" ex. dia. by 87" long |
| k | 2 | Dynamo air bottles | 10½" ex. dia. by 74" long |
| l | 1 | Silencer | ..... |

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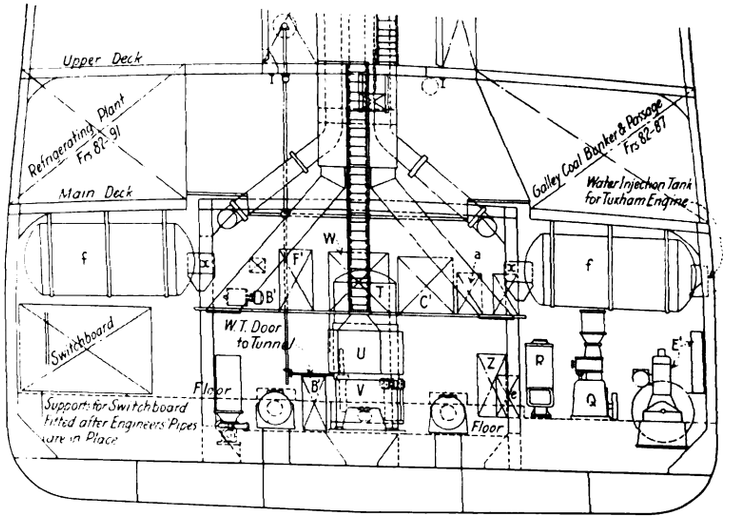
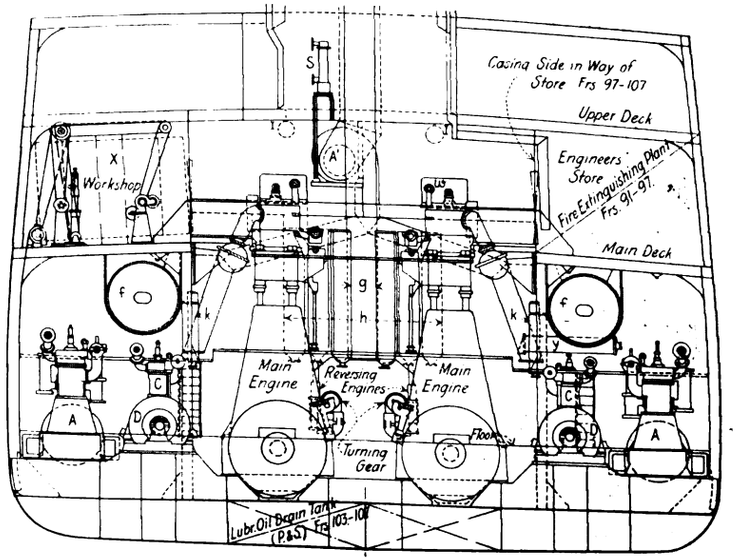
**List of Auxiliary Machinery, etc., Continued.**

| Mark | No. | Description | Size |
|---|---|---|---|
| m | 1 | Workshop motor | ..... |
| n | 1 | Drilling machine | ..... |
| p | 1 | Lathe | ..... |
| q | 1 | Grindstone | ..... |
| r | 1 | Emergency bilge pump | ..... |
| t | 1 | Clayton fire extinguishing machine | 100 tons per hr. |
| w | 2 | Spare cyl. covers | ..... |
| x | 2 | Spare pistons | ..... |
| y | 1 | Oil cooler | ..... |
| $A^1$ | 1 | Sirocco fan | ..... |
| $B^1$ | 1 | W. t. door and gear | 30" dia. fan |
| $C^1$ | 1 | Lub. oil settling tank | ..... |
| $D^1$ | 1 | F. o. drain tank | 1½ tons |
| $E^1$ | 6 | Portable fire extinguishers | 105 gals. |
| $F^1$ | 1 | Tuxham engine, dynamo and tanks | 44 k.w. dynamo |
| $G^1$ | 1 | Observation tank | 200 gals. |
| $H^1$ | 6 | O. f. drain water tank | 65 gals. |
| $K^1$ | 1 | Foamite fire foam extinguishers | 2 gals. |
| $M^1$ | 1 | Hand lub. oil pump | ..... |
| $N^1$ | 2 | Hand pump for o. f. drain | ..... |
| $P^1$ | 1 | Teledep indicator | ..... |
| $Q^1$ | 1 | Exhaust heat. boiler | 4' 6" dia. by 7' 10⅝" long; total heat. surf. 1,070 sq. ft. |
| $R^1$ | 1 | Exhaust heat. boiler feed tank | 60 gals. |
| $S^1$ | 1 | Exhaust heat. boiler feed injector | Size 5, bore 1" |
| $T^1$ | 1 | Blake boiler injector | Size 3½, bore ¾" |
| $U^1$ | 1 | De Laval separator | 100 to 120 gals. per hr. |
| $V^1$ | 1 | De Laval separator tank | 65 gals. |
| | 1 | Drain tank for aux. boiler saveall | 5 gals. |
| | 1 | Sand tank | 8 cu. ft. |




SECTION LOOKING AFT

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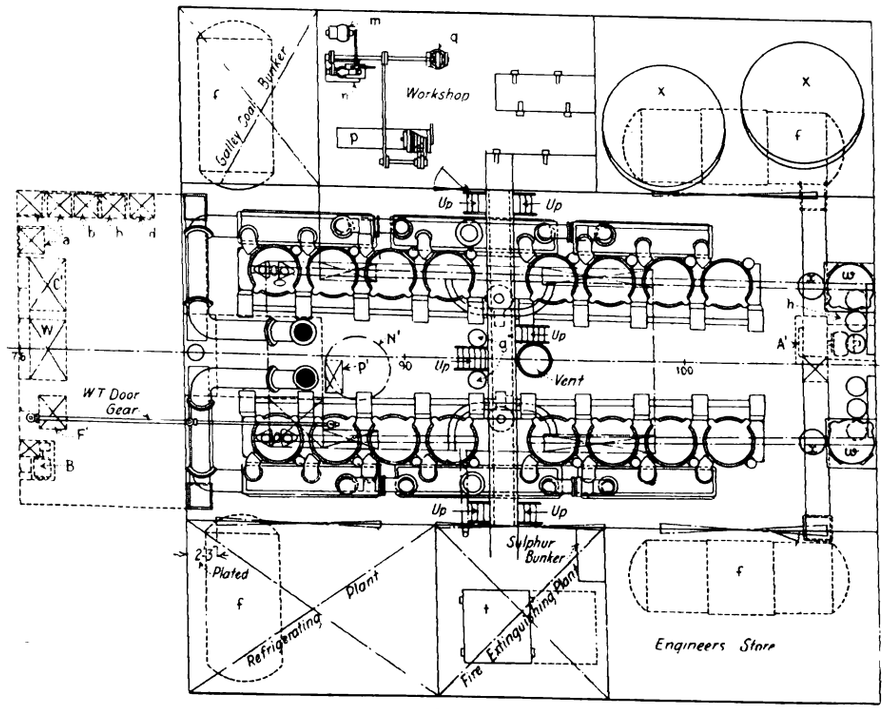


PLAN AT MAIN DECK

**Machinery Arrangement of Motorship Domala**

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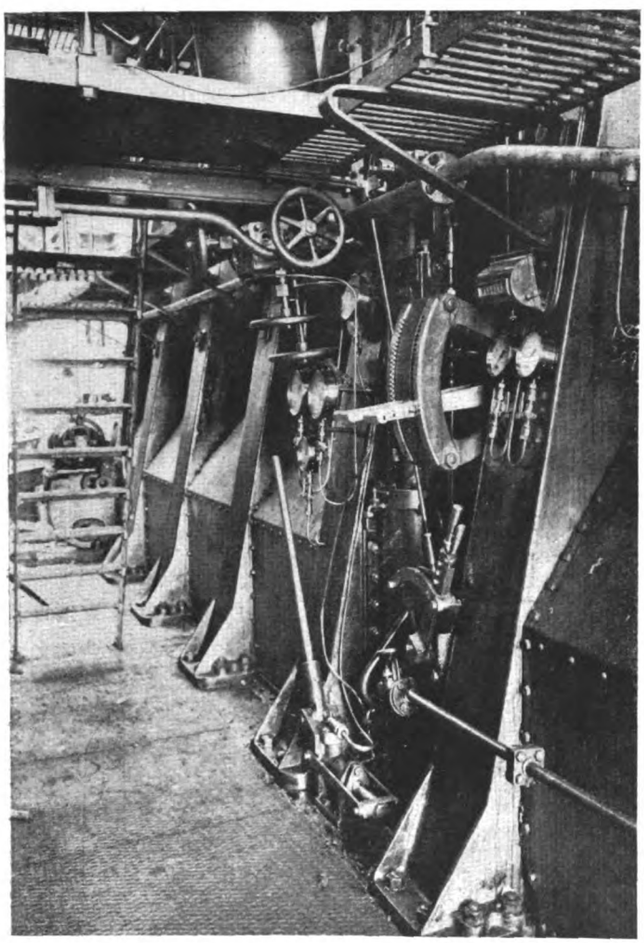
operating and reversing mechanism, which is quite novel. There are eight cams on the camshaft for actuating the four valves in each cylinder, one set for ahead and the other for astern running. The movement of the valves is effected through push rods and horizontal rocking levers. When it is required to bring the astern cams into action, the servo motor controlled from the starting platform causes the camshaft to be lowered and then moved in a longitudinal direction so as to bring the astern cams into position. The camshaft is then raised and the mechanism is correctly timed for running astern.

The heavy bedplate of the engine is of box section and is in four parts. The comparatively light frames mentioned



**Control Station of One of the 2,000 Brake Horsepower Engines on the Domala**

above carry the crosshead guides. The piston cooling water reaches the piston head through a hole in the piston rod. Sea water is used for piston and for cylinder cooling but separately driven electric pumps are provided in the engine room for this purpose, the pressure of the piston cooling water being somewhat above that of the circulating water used for the cylinders and cylinder covers. The eight fuel pumps are driven from a spur wheel on the vertical shaft, transmitting the crankshaft motion to the camshaft and the speed of the engine is controlled in the normal manner by the two throttle levers (one for each group of four cylinders) varying the period of opening of the suction valves of the fuel pumps.

### Auxiliary Machinery

The auxiliary machinery calls for some comment as part of the system has not previously been adopted on any motor ship. There are two large three stage air compressors each coupled to a six cylinder Diesel engine of 400 brake horsepower which serves for the supply of blast injection air as well as that required for starting purposes. This is necessitated in view of the fact that the main engines do not drive their own compressors. When the vessel is at sea one of the Diesel driven compressor sets serves for both main propelling motors, although it will apparently be nearly loaded up to full power, thus indicating the amount of power taken by the blast air compressor on a Diesel engine.

The electrical generating plant comprises a couple of 300 horsepower six cylinder Diesel engines running at the extremely high speed of 375 revolutions per minute and driving 220-volt 215-kilowatt direct current generators. All the engine room pumps including two cylinder cooling, one piston cooling, two lubricating oil, ballast, fresh water, sanitary and bilge pumps are coupled to electric motors, but the boiler will have to be in service the whole time at sea owing to the galley requirements.

An electric refrigerating plant is provided and there is an emergency dynamo driven by a hot bulb engine to supply electric power in case of the engine room being flooded.

## Navy Yards Cannot Bid for Reconditioning of Leviathan

PRESIDENT HARDING has announced in a letter to Representative Dallinger of Massachusetts that the work of reconditioning the *Leviathan* cannot be done at the Boston Navy Yard, as urged by Mr. Dallinger, but that the contract will be let, if Congress is willing to appropriate the necessary funds, to the private company that makes the lowest bid. The President gave as his reason that a navy yard cannot, under the laws, submit a definite bid for the work and also that it is the policy of the administration, as well as of the Jones merchant marine law, to encourage private shipbuilding enterprises. He also pointed out that insofar as the work would tend to relieve unemployment, the result would be the same wherever the work is done.

While no direct appropriation for the *Leviathan* has been asked by the Shipping Board, the question as to whether the money should be spent has been put up to Congress in the statements made before the appropriations committee by officials of the board, who have shown how much money is needed for various purposes and just what use it is proposed to make of it. An estimate of the amount necessary to recondition the ship has been included in the calculations as to the use proposed to be made of the appropriation of $55,000,000 from the proceeds, if the liquidation of assets is continued.

## Conference of Maritime Nations Proposed

HOMER FERGUSON, president of the Newport News Shipbuilding and Dry Dock Company, in a conference with the President on January 9, attended also by Chairman Lasker of the Shipping Board and Senator Jones, urged that a plan be submitted to the arms limitation conference for calling a conference of the leading maritime powers to discuss merchant marine questions, including a proposal for a pooling of ocean commerce so that the ships of each nation could be assured of 50 percent of the direct traffic to and from its ports. The President was not in agreement with this suggestion, on the ground that the agenda of the arms conference should not be added to, but expressed the opinion that there are many questions which might profitably be discussed at such a conference at some other time.

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# Diesel Electric Propulsion of Ships

## Advantages of Diesel Electric Drive—Types of Vessels for Which It Is Applicable—Comparison With Steam

By Commander S. M. Robinson, U. S. N.

At the present time the greatest interest is being manifested by all marine engineers in the development of the Diesel engine for marine purposes. This is doubtless partly due to the fact that the World War practically stopped all development of the marine Diesel engine except in the case of the submarine as there was no time for experimental work. But this check seems to have given added impetus to the development work going on at the present time. This is particularly true of the European shipbuilders. The British have tackled this problem with characteristic thoroughness as is evidenced by the great number of types of marine Diesel engines that they have under construction and in operation.

The saving in fuel that is effected by the Diesel engine over all other forms of propulsion is so great that it appears to be only a question of a short time before it will entirely replace steam in certain classes of ships and eventually it will probably be found in all classes of ships. The increasing cost of fuel makes this saving of greater importance as time goes on. This fact is apparently recognized in Europe where a large percentage of ships building are being equipped with Diesel engines.

It would seem that the development of the Diesel engine could be carried on much more rapidly, if every one appreciated the possibilities of electric drive in connection with it.

### Advantages of Diesel Electric Drive

For one thing, it makes possible the use of large powers at once; it is not necessary to wait till the Diesel has been developed in large units as a number of small units can be used to give the desired power.

Also, the Diesel is inherently poor in maneuvering qualities; for example, its speed cannot reliably be reduced below about one-third speed and it has to be started and reversed by air. The use of air is not only entirely unsatisfactory but is distinctly bad for the engine; also air control requires complicated valve mechanism (and therefore complicated cylinder heads) and air storage bottles. These disadvantages are entirely done away with by the use of Diesel electric propulsion.

The present practice in regard to the speed of the Diesel engine gives a propeller that is not the most efficient and the tendency is toward still higher speeds. One need only compare the high speed engines of a submarine with those of a merchant ship to see what the possibilities are in regard to saving weight by increasing the speed. With electric propulsion, the higher the speed of the engine the more suitable it will be as a prime mover and the motor speed can be arranged to give the most efficient screw.

There is no question but what very little time and money have been spent on the development of a reliable high speed engine as compared with what has been spent on the slow speed engine. When more attention is paid to obtaining perfect balance, it is probable that the high speed engine will develop very rapidly as it will make it possible to get large powers with small cylinders, thus avoiding many of the difficulties of design.

The reliability of the Diesel engine is much improved by the use of electricity in connection with it; this is due partly to the fact that air starting and reversing are eliminated and partly to the use of multiple units; this latter advantage will be discussed more in detail when considering individual cases.

These are the general advantages of Diesel electric propulsion but a proper discussion of this subject can be had only by considering each type of ship separately and in each case the conditions must be chosen to represent actual conditions as nearly as possible. Several papers have recently been presented on this subject and they have not followed this rule; for example, if we have a 2,000 shaft horsepower ship driven by twin Diesel engines running at 150 revolutions per minute, obviously it is no comparison at all if we choose twin screws running at the same speed for the electrically propelled vessel. To get a real comparison, we should use a single screw running at about 90 revolutions per minute, otherwise we deliberately throw away a very considerable part of the advantage of the electric propulsion for this case.

### Why Direct Current Is Used

The first question to be decided in connection with Diesel electric propulsion is whether direct current or alternating current will be employed. Where it is desired to have two or more units operating together to drive the motor (or motors) on one propeller shaft, it will be advisable to use direct current. This is due to the fact that Diesel engines do not operate well in parallel as the governor regulation is not sufficiently good. It is true that Diesel driven generators are successfully operated in parallel on shore but it would be out of the question on board ship or any place where it is necessary to change the speed of the engines while keeping them in parallel as would be the case if alternating current were used. By using direct current, the generators and motors can be operated in series so that close regulation of the engine speed will not be required. Direct current also obviates the necessity for changing the engine speed since speed variations can be taken care of by varying the generator or motor voltage.

When using direct current, series operation will usually be desirable not only because it is more suitable for the engines but also because it is better electrically. Voltage variation would be used for propeller speed control and, with parallel operation, this would require generators with practically identical saturation curves and very carefully adjusted field rheostats, while with series operation no such requirements would exist. But more important still, the failure of one unit reduces the power more with the parallel than with the series operation since in the former case it would be necessary to reduce the generator voltage to accomplish the necessary reduction in propeller speed and this would lower the output of the generators. With series operation, the generators would work under practically full load conditions regardless of the number in use.

### When Alternating Current Would Be Advisable

In the case of ships fitted with two or more propellers, each having its motors driven by its own generator, it will usually be preferable to use alternating current owing to the greater efficiency of transmission. In the case of large powers, there would also be greater reliability and a reduction in weight and space. Here the difficulties previously mentioned would not exist since the generators would not be operated in parallel and the speed of each engine would be independently controlled. In case of failure of one generating unit, the other would be used to drive all motors, the latter being operated in parallel, which would be satisfactory.



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The first type of vessel to be considered will be the low powered merchant vessel since Diesel electric propulsion offers more advantages for this type of vessel than for any other at the present time.

### Application to Low Powered Merchant Vessel

The power involved is small so that the generators used for propulsion will also be suitable for furnishing power to run the deck winches when in port. This represents a large saving in weight and space and gives economical service.

There will be no loss of propulsive efficiency due to the use of the electric transmission with these ships. This is due to the fact that a single, large, low speed propeller will be used with the electric propulsion and two propellers of higher speed with the direct propulsion. The appendage resistance with the two-propeller arrangement added to the increased thrust deduction just about makes up for the electric losses. The single, low speed propeller is more efficient than the high speed propellers so that the overall efficiency should be somewhat greater with the electric propulsion than with the direct propulsion.

### Arrangement of Machinery

An ideal arrangement for this type of ship consists of three generators driving two motors on one propeller shaft. The generators and motors would be separately excited. The excitation would be furnished either from small generators direct connected to the main units or from separate generators which could be used for furnishing power to the ship's circuits. When using the main units, the direct-connected exciters not used for excitation would be used for the ship's circuits, thus making it possible to shut down all generators except the main units.

All units would be started electrically, using the generator as a motor. Power for this purpose would be furnished by small independent generators; these, in turn, would be started by a small generator which could be started by hand so that it would never be necessary to use air for starting.

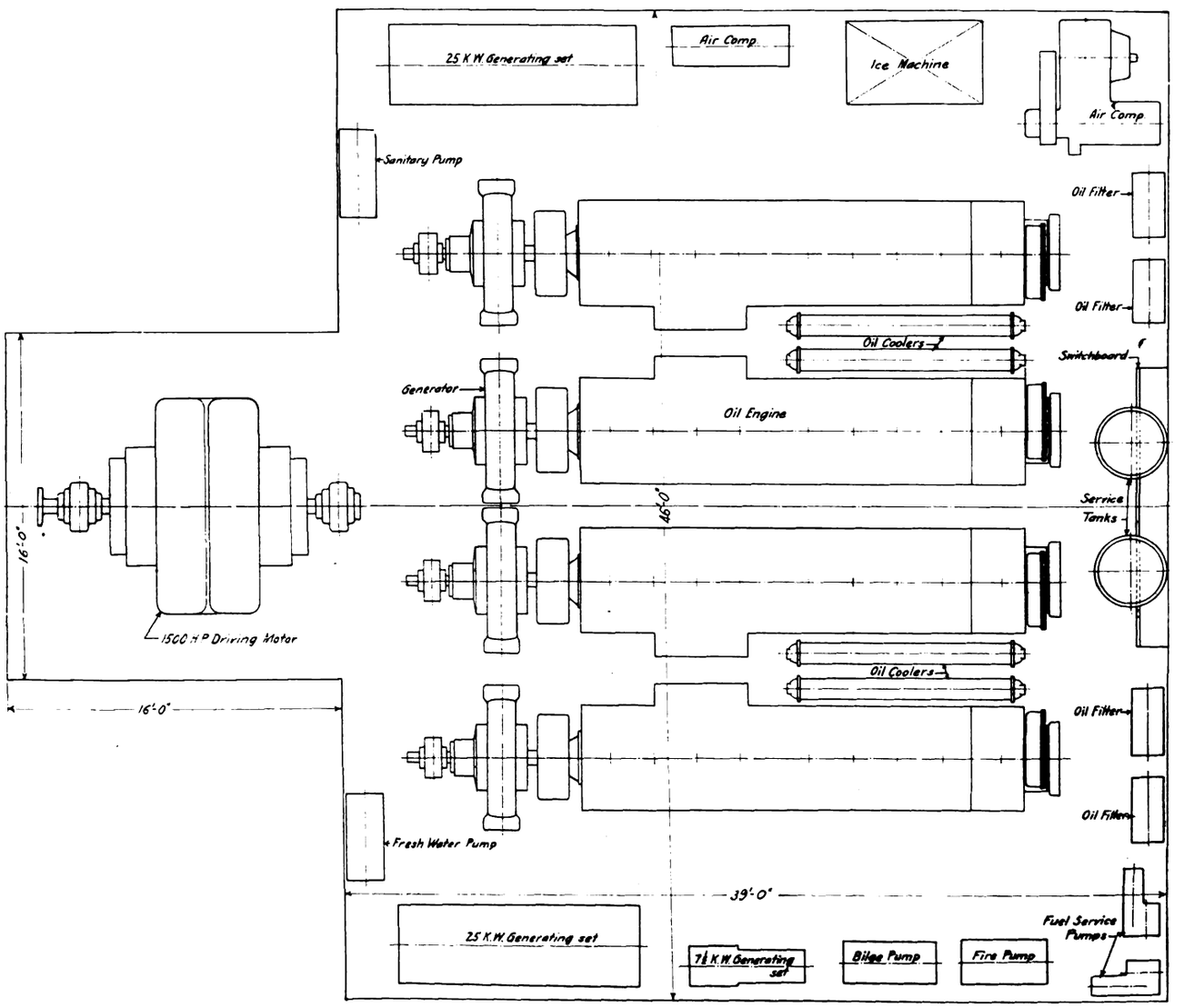


Fig. 1

The generators and motors would all be connected in series; reversal would be accomplished by reversing the generator field. With this type of ship, it would not be necessary to provide armature resistance to get the necessary torque for reversal; the friction load of the Diesel engine, shafting, etc., is sufficient for this purpose in this case. With high speed, high powered ships this would probably not be true.

### Speed Control

Speed control would be accomplished by varying the field of the generators or the motors or changing the speed of the engines, according to circumstances. Normally, speed changes

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would be effected simply by varying the generator field strength and this method would always be used for maneuvering.

To show how the different methods of speed control can be used and also how the ship would be operated at reduced power, the case already assumed—that of three generators and two motors—will be analyzed in detail.

If it were desired to operate at full speed all units would be in use. Reduction of speed would be accomplished by decreasing the generator field strength. If it were intended to make a trip at slightly less than full speed, it would probably be best to operate the engines at a slightly reduced speed. This speed once set, however, would not be changed.

If one main unit were out of commission, the other two generators and the motors would be run in series. The generators would be run at normal speed and would carry the same current and voltage as before and would therefore have the same efficiency as before. There would be available two-thirds (67 percent) of the full power and since the power varies approximately as the cube of the revolutions, the propeller would run at 87 percent of its full speed and the ship would be propelled at 87 percent of its full speed. Since the torque varies as the square of the revolutions, the torque required would be 77 percent of the full load torque and therefore the field strength of the motors would be 77 percent of full field; each motor would be developing 67 percent of its normal full power and would fall off slightly in efficiency. To sum up this condition, the generators would be operating at 100 percent speed, 100 percent voltage, 100 percent current and normal efficiency; the motors would be operating at 67 percent power, 87 percent speed, 77 percent field strength, 100 percent current and slightly reduced efficiency; the ship would be propelled at 87 percent speed. Speed reduction would be accomplished by decreasing the field strength of the motor.

If two main units were out of commission, the remaining unit and one motor would be used. The generator would be run at normal speed, current and voltage and therefore the efficiency would be the same as at full power. The propeller would run at 70 percent speed. The torque on the propeller shaft would be 50 percent of that at full power but since only one motor would be used that motor would develop 100 percent of its full load torque and would therefore carry 100 percent normal field strength since it would be carrying normal full load current. There would be a slight decrease in motor efficiency. To sum up this condition, the generator would be operating at 100 percent speed, 100 percent voltage, 100 percent current and normal efficiency; the motor would be operating at 67 percent power, 70 percent speed, 100 percent field strength, 100 percent current and slightly reduced efficiency; the ship would be propelled at 70 percent speed. Speed reduction would be accomplished by decreasing the generator field strength.

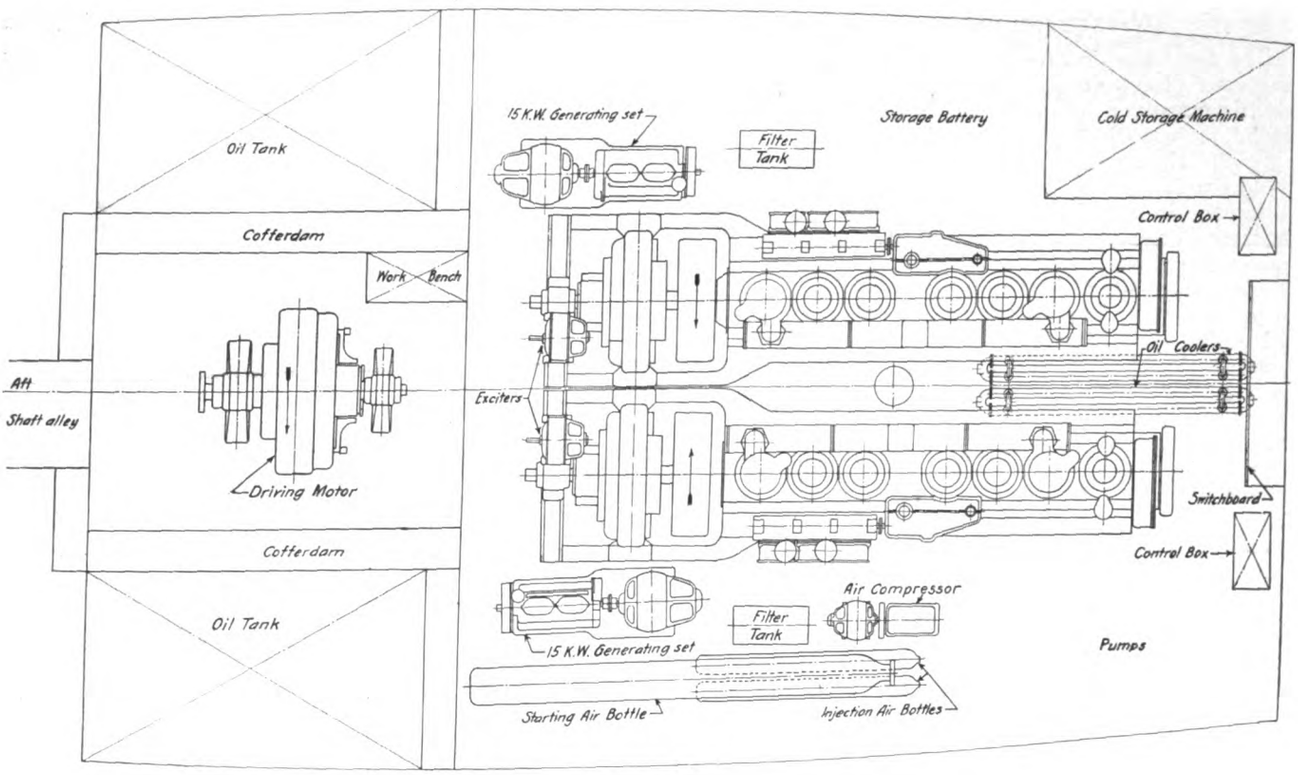


**Fig. 2**

### PROPOSED MERCHANT SHIP INSTALLATION

An arrangement for Diesel electric propulsion as proposed by the Winton Company is shown in Fig. 1. This arrangement consists of four main units and two main motors arranged as a double armature motor to save space and weight. There are two 25-kilowatt generating sets for general ship's service and a 7½-kilowatt generator arranged for hand starting. All auxiliaries are motor driven. The main units are provided with direct-connected exciters which can be used either for excitation or ship's service. The voltage of the main generators is such that they can be used for running cargo winches.

Diesel electric propulsion offers a means of modernizing ships which are equipped with steam plants. For example, many of the Emergency Fleet Corporation ships which are equipped with turbines and reduction gears could readily be converted into Diesel electrically propelled ships without any change in propellers, shafting or bulkheads. This would make these ships operate at about one-third of the present fuel consumption.

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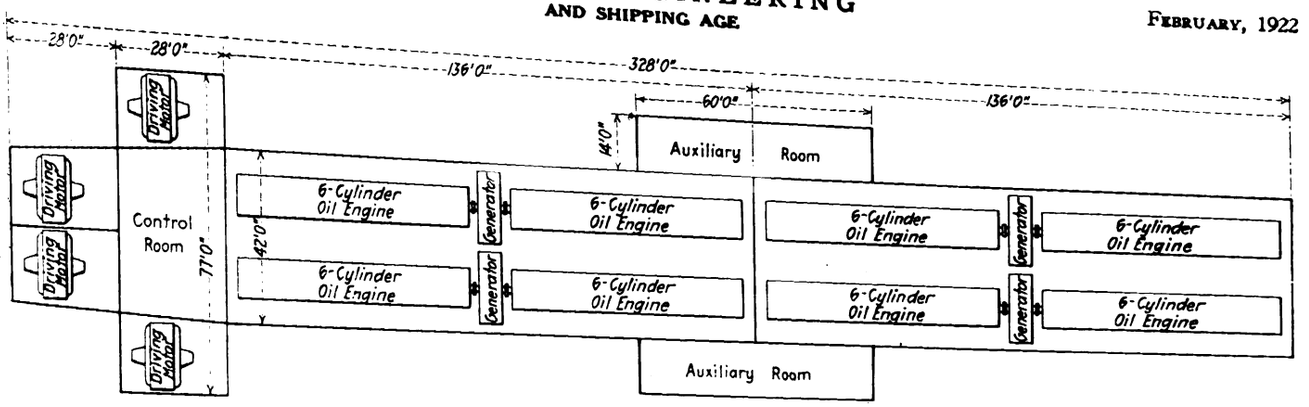


Fig. 3

### YACHTS AND PLEASURE CRAFT

The next class of vessel to be considered will be yachts and other pleasure craft. The special advantages of Diesel electric propulsion here are that it provides a long cruising radius at reduced power and at the same time gives high speed for short runs; also the machinery can be located so as to give the best accommodations for the passengers. The advantage in regard to increased cruising radius is quite marked. Assume that cruising would be done at about half power; the direct connected Diesel would be run at about 79 percent speed and 50 percent power, if both engines were used or else at not more than about 70 percent speed and 70 percent power (assuming that the normal mean effective pressure should not be exceeded), if one engine were disconnected and the screw allowed to revolve freely while the other engine was used for driving the ship. The latter arrangement would necessitate the use of clutches for disconnecting the engines. In the first case the engine efficiency would not be nearly so high as at full power; in the second case, the horsepower required would be very materially increased by the dragging screw; in neither case would the propeller efficiency be as high as for the single screw electric arrangement. With the latter, the ship would cruise at 79 percent speed with one main engine running at full speed and full power (assuming two units to be installed).

An arrangement of machinery for Diesel electric propulsion for this type of vessel is shown in Fig. 2, which is a plan of the engine room of the schooner yacht *Guinevere*. The machinery consists of two 350-horsepower Winton engines operating at 225 revolutions per minute and driving two 225-kilowatt Westinghouse generators, and a 550 horsepower Westinghouse motor driving a propeller at 220 revolutions per minute. A 15-kilowatt exciter is connected to each main unit by a chain drive. All of the generators give 125 volts. All auxiliaries, including the steering engine, are electrically driven.

### DOUBLE ENDED FERRYBOAT

Another type of vessel for which Diesel electric propulsion offers special advantages is the double ended ferryboat. As usually arranged, these boats have two propellers, one at each end of the ship; both are placed on the same shaft and are driven by an engine located near the center of the ship.

This is an extremely inefficient arrangement since both screws are driven at the same speed. The result is that the screw current of the forward screw is discharged against the bow of the boat and adds enormously to the horsepower required to drive the boat through the water. This may amount to 40 percent or more of the effective horsepower required to propel the ship.

The proper method of operating these propellers is to drive the forward propeller at a speed just slightly above that at which it would run if it were allowed to revolve freely while the ship is being driven by the other propeller—in other words, just fast enough to prevent it from acting as a drag on the ship. This speed is approximately 70 percent of the revolutions corresponding to the speed of the ship. This method of operation requires that the two propellers be on separate shafts. With electric motors, it is a very simple matter to adjust the speeds of the two motors quite accurately and quickly since it would be a matter only of watching the ammeters of the two motors. The same result might be approximated in an engine-driven boat by using a separate engine to drive each propeller but there would be no means of adjusting the speeds accurately and, in any case, the method would not be efficient since one engine would always be running with practically no load.

### FLEXIBILITY OF INSTALLATION

Another advantage of this method of propulsion for this type of vessel is the flexibility in regard to installation. This is well illustrated by the ferryboat *Poughkeepsie* being built for the Highland Ferry Company. This vessel has a very wide flat hull with a "hull-fin" extending below the main hull. The hull-fin carries the propelling motors and in this case is nothing but a deep shaft tunnel. It would hardly be possible to place engines in such a narrow compartment but it enables the propellers to work in solid water as they are entirely housed by the hull and also to work in water which is unbroken since there are practically no obstructions ahead of the propellers.

The stability of the vessel is obtained by the use of the broad flat hull which makes it practically impossible to capsize her by loading. Unfortunately, the *Poughkeepsie* is arranged with both motors and both propellers on one shaft so that the great advantage of increased propulsive efficiency will not be realized.

### RELIABILITY IN MANEUVERING

For ferryboats perhaps the most important advantage of the Diesel electric over the direct Diesel drive is the greatly increased reliability in maneuvering. It is perhaps no exaggeration of the facts to say that, at the present stage of development, electricity makes possible the use of the Diesel engine with this type of vessel.

Other more minor advantages of Diesel electric as compared with steam installations are the absence of stand-by losses when the vessel is not running and the absence of a smoke pipe which makes it possible to have a perfectly clear main deck, thus much improving the freight and passenger carrying space.

The limitations as to size have in the past prevented the consideration of the Diesel engine for high powered ships such as capital ships of the Navy and passenger vessels but the present rapid development of this engine indicates that these limitations will shortly be removed. Even at the present time, several of the best engine builders are prepared to furnish units of 6,000 brake horsepower in six cylinders. It is interesting to see what could be done with an installation in a capital ship using this unit as a basis.

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### DIESEL ELECTRIC DRIVE FOR A CAPITAL SHIP

Fig. 3 shows an outline of such an installation. It consists of eight 6,000 horsepower engines driving four generators which furnish current to four induction motors driving four propellers. The 12,000 horsepower generator is placed between the two engines so that it is unnecessary to transmit power through more than six cranks. The installation will also be lighter and occupy less space than it would if a separate generator were used for each engine. There is, however, a more important reason for not using more than four generators.

For transmitting this amount of power it will be preferable to use alternating current at much higher voltage than would be possible with direct current. This is desirable from the standpoint of efficiency, weight, space and reliability. The objections to the use of alternating current disappear with this type of installation since each generator would drive its own motor and the generators would at no time be connected together. When cruising at reduced speeds either one or two generators would be used. In the first case the motors would all be in parallel; in the second case, each generator would drive two motors connected in parallel, on one side of the ship.

### COMPARISON OF WEIGHTS

It is interesting to compare the weight of such an installation with a steam drive. It is estimated that the main units of the installation described above would weigh about 3,120 tons; this includes the weight of the Diesel generators, main motors, switchboards and cable. The total installation in the ship would weigh about 4,130 tons. A corresponding steam installation would weigh about 3,560 tons or 570 tons less than the Diesel electric. If we assume a fuel supply of 3,000 tons for the steam installation, this would leave 2,430 tons for the Diesel electric in order that the two should have equal weight at the beginning of a cruise. The Diesel electric installation would use not more than half the fuel that the steam drive would require so that the cruising radius would be increased $\frac{2430}{1500}$ or 1.625 by the use of Diesel electric propulsion.

There is no question but what the future development of the Diesel will give us a lighter engine for the large powers so that the comparison in regard to fuel will be even greater in favor of the Diesel. The double acting Diesel is still in its infancy and the same can almost be said of the crosshead engine; but that the development of the Diesel from now on will be rapid no one can doubt and it would appear that, eventually, there should be no limitation as to its uses for marine purposes.

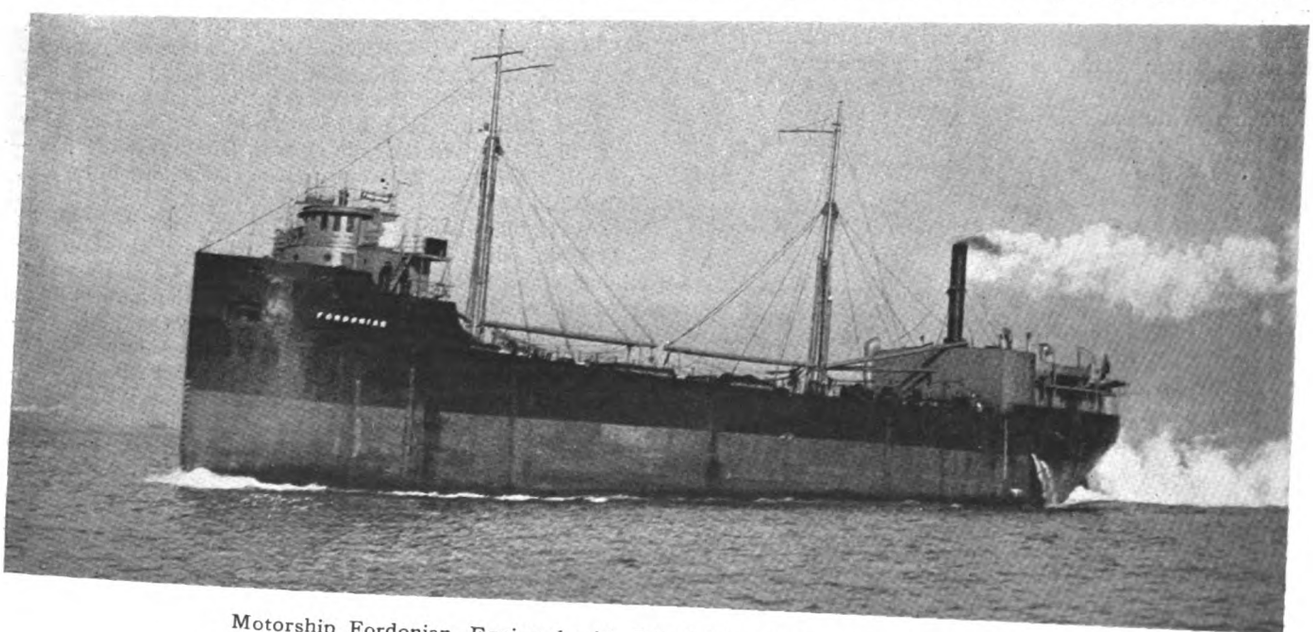
# Diesel Electric Cargo Vessel Fordonian Given Trial

## First American Sea-Going Motorship to Be Fitted With Diesel Electric Method of Propulsion

THE *Fordonian,* the first ocean going merchant ship in the United States to be equipped with the Diesel-electric method of propulsion, was given her official sea trial on January 13. A party of over fifty prominent marine engineers and shipping men attended the trial, which shows an unusual amount of interest in the claims set forth for the adoption, from the economical standpoint, of the Diesel electric drive for cargo ships.

The *Fordonian,* which was formerly fitted with direct Diesel drive, was re-engined by the Tebo Yacht Basin of the Todd Shipyards Corporation. She is 250 feet long with a 42-foot beam and has a gross tonnage of 2,368 tons. The vessel is owned by the American-Mediterranean Steamship Company, McDonnell and Truda, agents, and will be engaged in the freight traffic between New York and Havana. The *Mariner,* a 200-ton fishing trawler, is the only other commercial ship with a similar machinery installation in this country today.

The *Fordonian* represents the culmination of several years of development work in successfully adapting electric trans-



Motorship Fordonian, Equipped with Diesel Electric Drive, on Her Trial Trip

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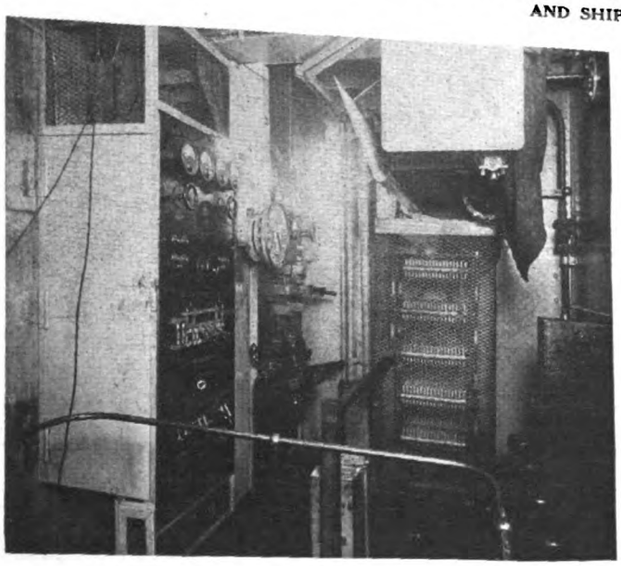
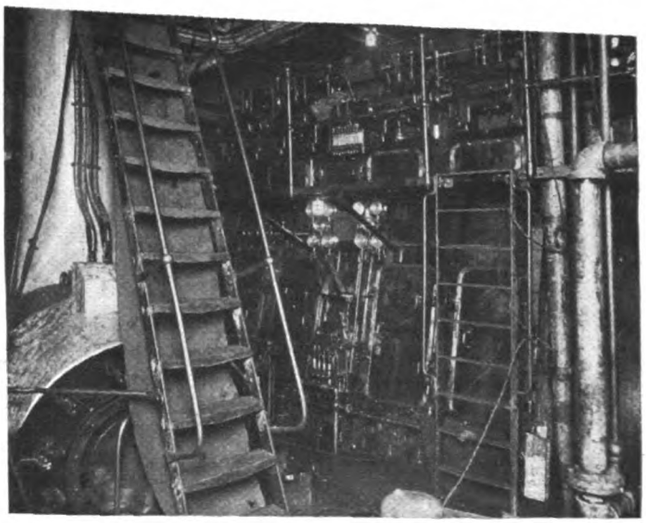


View of Switchboard, Rheostat and Operating Station



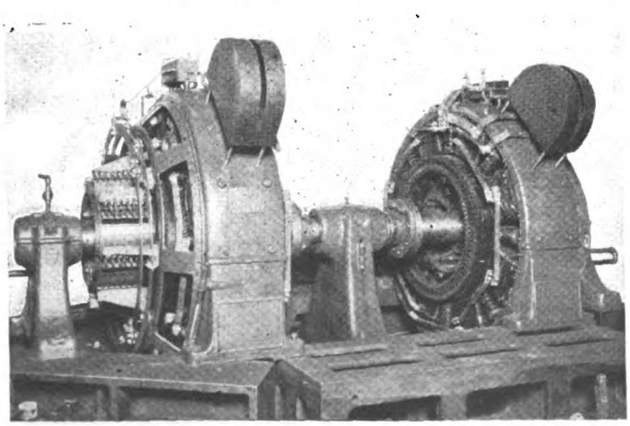
Propelling Motor and One of the Main Engines

mission to the oil engine for large ships. The electric apparatus is of the General Electric Company type consisting of two 350 kilowatt generators each driven by a two cycle four cylinder Ansaldo San Giorgio Diesel engine of 500 brake horsepower. Motive power is supplied by a double armature 850 horsepower motor direct connected to the propeller and designed to furnish a speed of about nine to ten knots.

The control is from the engine room and has been devised to give the utmost flexibility of operation. The main control equipment consists of a panel on which are mounted the various switches, field rheostats and instruments; a master controller for operating the contactors of the control group; the control group for starting and reversing the motor, and a starting resistor and motor field resistor for obtaining lower speed ranges. The normal operating propeller speed is 120 revolutions per minute. The control arrangement allows for the use of either or both generators supplying current to the propeller motor, depending upon the speed requirements.

Captain C. J. Dyer of the *Fordonian* declared after the trials that the performance of the ship had exceeded his best expectations and that the ease with which she was maneuvered and controlled in the congested shipping of New York Bay "gives promise of a bright future for ships using Diesel engines in combination with electric drive. I wouldn't change her for a steam driven ship under any condition." W. N. Hooks, chief engineer, was equally pleased with the performance of the ship.

The *Fordonian* developed a speed of 10.12 knots on the trial, which greatly exceeded the expectation of the captain. In order to develop full propeller speed of 120 revolutions per minute the motor developed 720 horsepower at the propeller shaft. With the ship fully loaded the motor will be called upon to deliver the full rated horsepower of 850 in order to turn the propeller at this speed.



Two 350-Kilowatt Direct Current Generators for the Fordonian

### PROMINENT SHIPPING MEN ATTEND TRIAL

Among the engineers present at the *Fordonian's* trials were the following: P. Bryan, General Electric Company; J. J. Brown, Westinghouse Electric Company; A. F. E. Horn, General Electric Company, Washington, D. C.; G. Smith, United States Engineers Office, War Department, Washington, D. C.; T. R. Vogel, United States Engineers Office, War Department, Washington, D. C.; Lieut. Col. H. Allen, United States Engineers Office, War Department, Washington, D. C.; Commander S. M. Robinson, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.; Commander Jones, U. S. N., Washington, D. C.; Commander Walton, United States Coast Guard; W. P. Marshouse, Pennsylvania Railroad Company; E. Keane, United States Government; P. J. O'Reilly, United States Boiler Inspector; H. Ehrlich, Custom Inspector; H. Westlake, Custom Inspector; W. Richardson, Custom Inspector; R. O. Dunham, T. S. Gandy and B. S. Beach, General Electric Company, Schenectady, N. Y.; L. R. Ford, Worthington Pump and Machinery Corporation, New York; L. V. Armstrong, Ingersoll-Rand Company; H. Schreck, Consulting Engineer, New York; S. Wright, Busch-Sulzer Bros.-Diesel Engine Company, New York; F. J. Moran, General Electric Company, Philadelphia, Pa.; M. J. Hekking, Texas Oil Company, New York; Theodore D. Wells, Naval Architect, New York; T. O. Lisle, Editor *The Motorship;* C. H. Kennerly, Old Dominion Transportation Company; H. Lund, Chief Engineer; A. St. James, Texas Oil Company, New York; N. R. Sibley, Westinghouse Electric Company, New York; George L. Kay, Surveyor, American Bureau of Shipping; George Pogue, Busch-Sulzer Bros.-Diesel Engine Company; F. B. Webster, Editor MARINE ENGINEERING AND SHIPPING AGE; W. M. Johnston, John Bliss and Company; J. B. Bassett, General Electric Company; M. S. Katzenstein, Worthington Pump and Machinery Corporation; L. G. Nunes, and G. Campiglie, Ansaldo Engine Company; J. W. Anderson and G. E. Edgar, New London Ship and Engine Company; P. Levinthol, Naval Architect, New York; A. Kennedy, W. H. Wild and J. Thomas, General Electric Company, N. Y.; P. McDonald, McDonald and Truda; Paul Henning and H. B. Taylor, United States Shipping Board.

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**Motor Tanker Zoppot, Fully Laden**

# The Motor Tank Ship Zoppot*

*The successful operation of the Zoppot over a period of eighteen months has brought the Diesel engine into prominence as satisfactorily meeting the service requirements for propelling machinery in large tankers. Heretofore the reciprocating steam engine has found the greater favor for this type of vessel on account of the quick turn around in port and the ability of the steam engine to stand up under continued service. The performance records of the Zoppot prove the ability of the Diesel engine to meet demands for reliability and undoubtedly will lead to keener interest in this more economical type of machinery when solving the powering problems of future tankers.*

THE motor tank ship *Zoppot,* which has been in service for over a year, covering 44,000 sea miles in the first ten months, has attracted considerable attention as a tanker, as well as a motorship, owing to its great size and carrying capacity. The *Zoppot* was built in the shipyard of Fried. Krupp Aktien-Gesellschaft of Kiel-Gaarden, Germany, for the Baltic American Petroleum Import Company of Danzig. It was recently taken over by the Standard Oil Company of New Jersey, however, and is now operating in the service of that company between New York, Baltimore and Mexico. Its style of construction and the installation of its main and auxiliary engines offer many notable improvements.

The vessel was constructed in conformity with the highest class of British Lloyd's with the designation ✠ 100 A-1 under special supervision and in accordance with the longitudinal system of framing. The *Zoppot* is the first large motor tank vessel built according to this system and the expectations of the builders have been entirely realized, for not only has more than 8 percent of the steel weight been saved as compared with transverse frame construction, which saving has added to the profits through increased cargo carrying capacity, but the longitudinal and transverse strength have in every instance been excellent. This was confirmed by experience on the first trips when, despite continuously heavy seas, no weak spots appeared in the strengthening of the hull. It must, however, be noted that the builders exceeded the requirements of the British Lloyd's and increased the scantlings of the reinforcement wherever they appeared insufficient, experiences gained with smaller vessels built according to the longitudinal framing system indicating the correctness of this precaution.

The principal dimensions and main particulars of the *Zoppot* are given in the following table:

| | |
|---|---|
| Length overall | 546 feet 11 9/16 inches |
| Length between perpendiculars | 524 feet 11 inches |
| Breadth, molded | 66 feet 2½ inches |
| Depth, molded to upper deck | 41 feet 2 7/16 inches |
| Draft with summer freeboard | 27 feet 7¼ inches |
| Deadweight at this draft | 15,500 tons |
| Gross tonnage | 9,932 |
| Net tonnage | 5.915 |
| Horsepower, shaft | 3,600 |
| Speed, knots | 10.5 |

The ship is built as a shelter deck vessel and has three continuous decks. The hold, which extends from the keel to the main deck, is divided by transverse bulkheads and a centerline longitudinal bulkhead to provide 22 cargo oil tanks, 11 on each side of the vessel. Cofferdams are fitted at the forward and after ends of the cargo tanks. A cofferdam is also arranged between tanks 2 and 3 and this, with the pump room, located amidships, separates the cargo tanks from each other in such a manner that three different kinds of oil can be carried simultaneously. On the second deck, outboard of the expansion tanks, are the summer tanks, of which there are also 22.

The total capacity of the cargo holds for oil amounts to 693,246 cubic feet. In addition to the tanks for liquid cargo there is a cargo hold between the collision bulkhead and the forward cofferdam and the entire space between the main deck and the shelter deck is also available for cargo. The capacity of these spaces amounts to 229,446 cubic feet.

The engine room, as customary in large tank vessels, is located aft.

## Hull

The construction of the hull is similar to the usual practice for longitudinally framed vessels.

There are 22 longitudinal frames on each side of the vessel below the main deck and 2 longitudinal frames between each of the decks above. Web frames are spaced 9 feet 2¼ inches apart and, as the cargo holds are uniformly 27 feet 6¾ inches long, there are 2 cross frames for each cargo hold. The oil tight longitudinal and transverse bulk-

*Translated from an article by Managing Director Oesten, Chief Engineer Alt., and Engineer K. Von Sanden of the Fried. Krupp Aktien-Gesellschaft, Germaniawerft, Kiel-Gaarden, Germany, which was published in *Werft und Reederei,* July 7, 1921.



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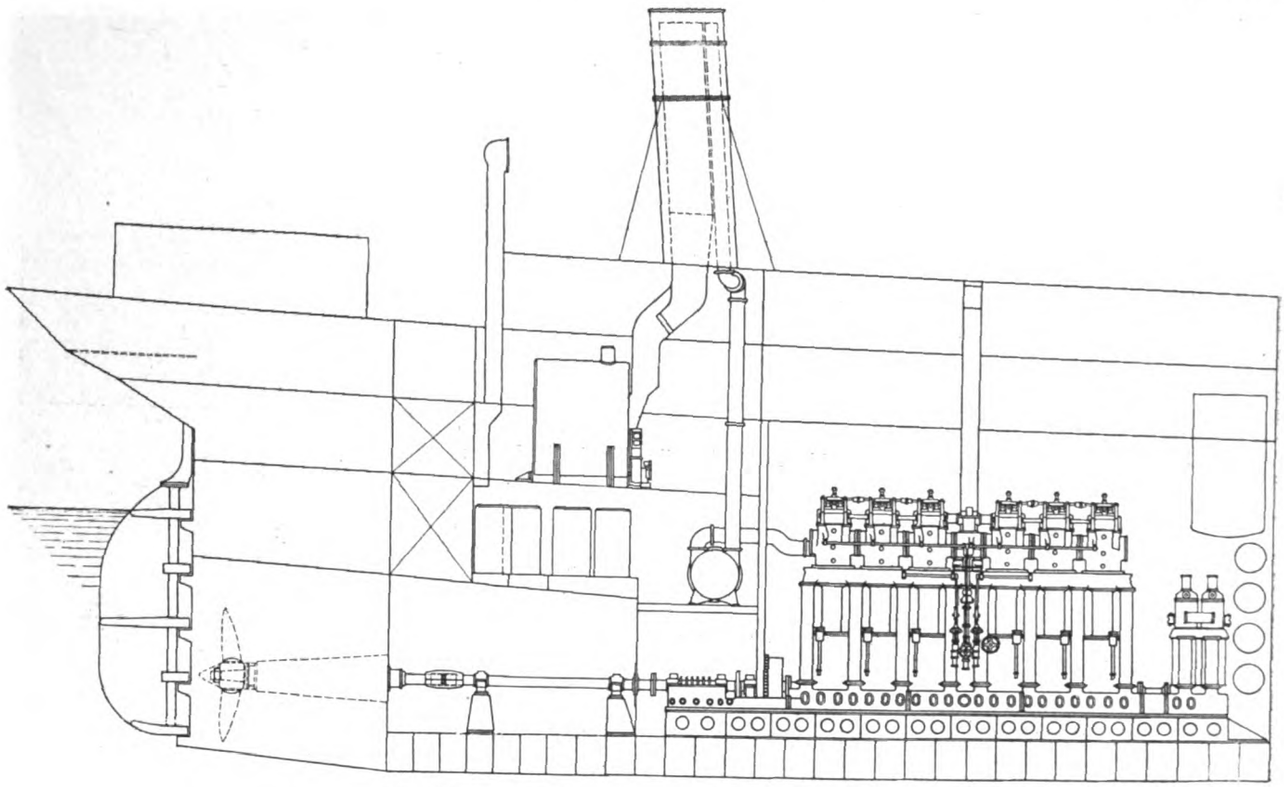
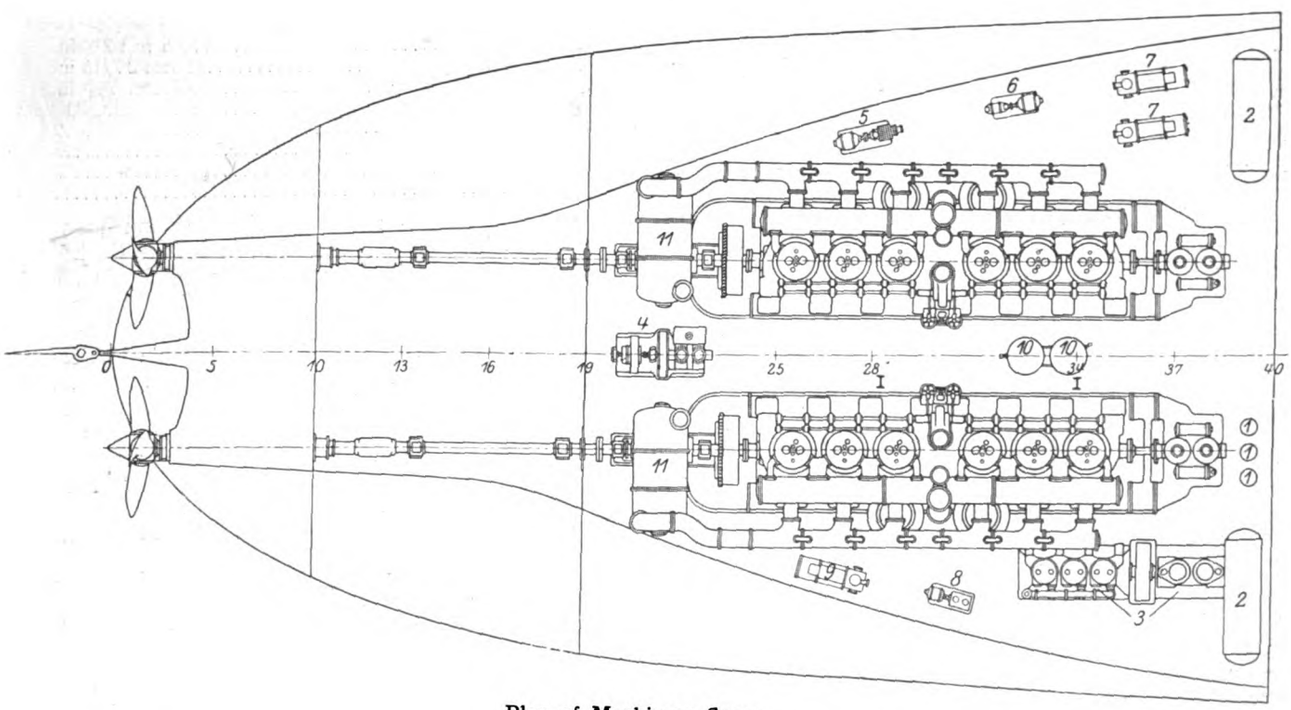


**Longitudinal Section Through Machinery Space**




**Plan of Machinery Space**

1—Air Supply Tanks
2—Starting Receivers
3—Diesel Auxiliary Compressors
4—Oil Engine Driven Dynamo
5—Electric Deck Washing Pump
6—Electric Ballast Pump
7—Duplex Ballast Pumps
8—Electric Oil Pump
9—Duplex Oil Transfer Pump
10—Special Fuel Tanks
11—Main Engine Exhaust Tanks

heads have horizontal plating and reinforcement and in the case of the transverse bulkheads 3 additional web frames are arranged on each side of the vessel. The longitudinal frames terminate at the transverse bulkheads and are connected by means of large brackets.

The stern post is notable because the propeller shaft struts are independent of the stern post proper, thereby effecting a saving in the weight of the steel casting.

The rudder is made up of a forged iron rudder stock and rudder-arms, the plate being 1.1 inches thick.

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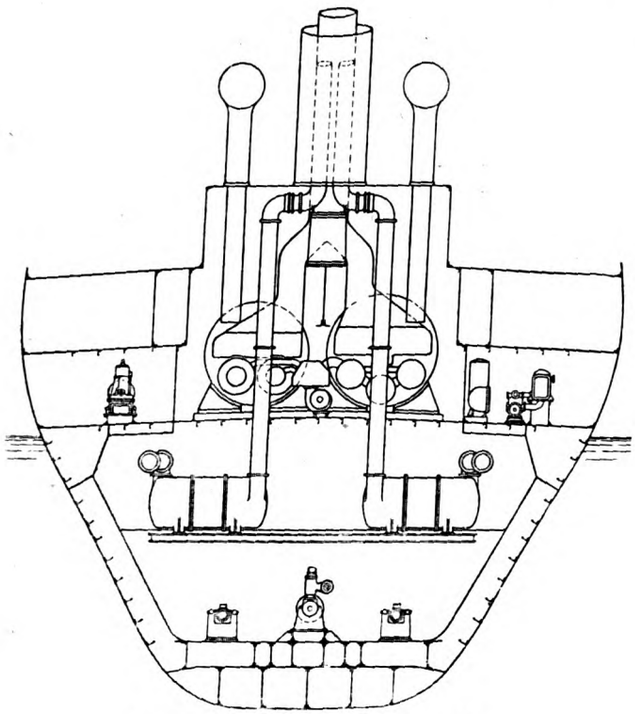
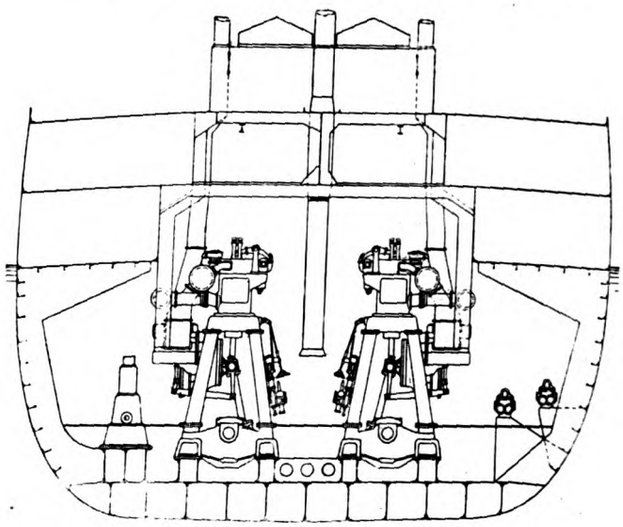


Transverse Section at Frame 24

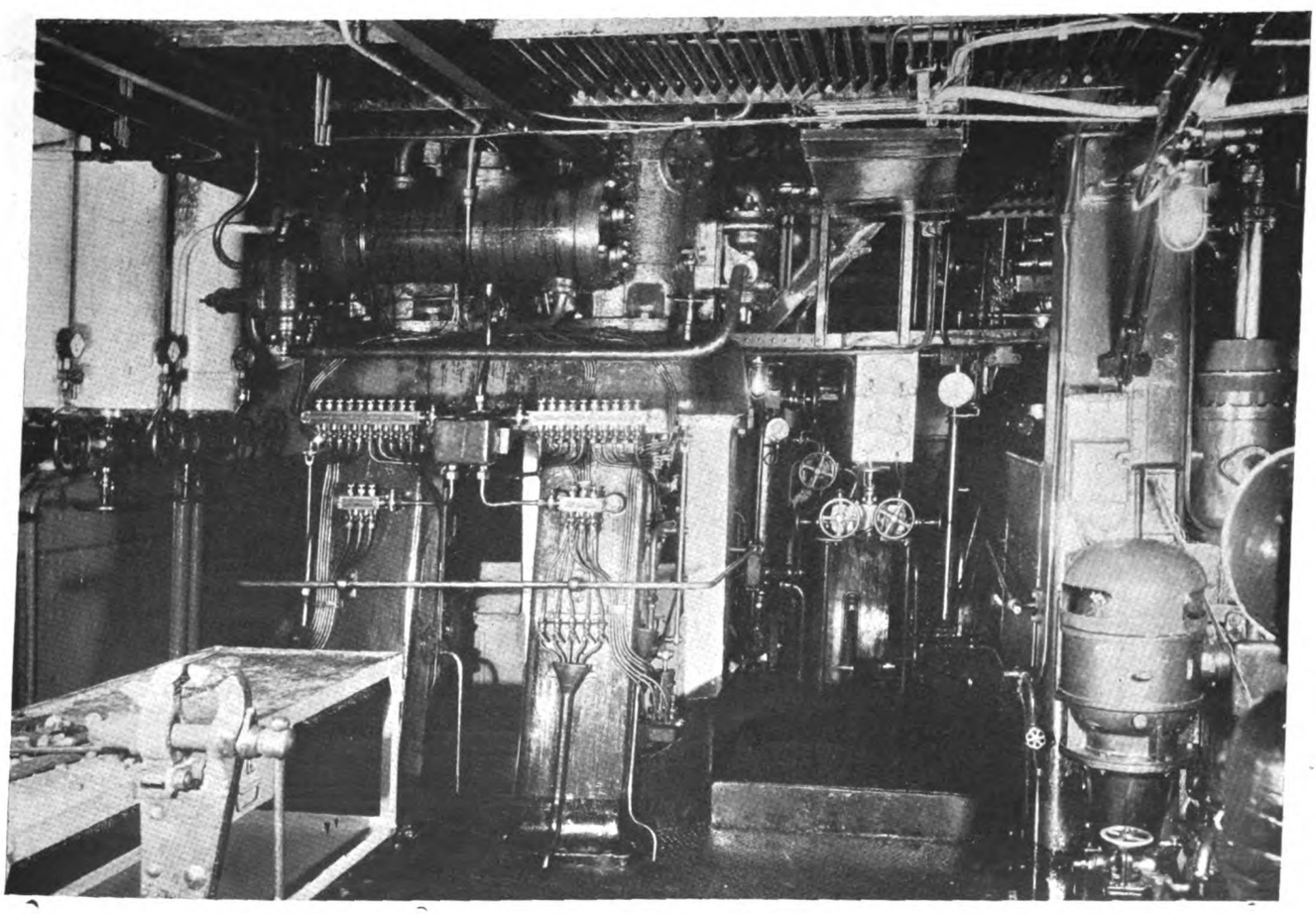
Cargo is discharged by two duplex, compound, steam pumps, 14.17 inches by 21.26 inches by 14.02 inches by 22.05 inches, each with a capacity of 500 tons per hour. These pumps are installed in the pump room. To empty the trimming tanks, the forward cargo hold and the cofferdam behind it, there is installed in the forward part of the vessel a duplex pump of 120 tons per hour capacity.



Transverse Section at Frame 37

The loading and discharging devices, as also the fittings and mountings of the main and summer tanks, conform essentially to those of standard practice.

Two derricks are located forward and two aft at special posts. They serve the loading hatchway forward and the hatchways for stores and food supplies.



View in Engine Room, Showing Diesel Auxiliary Compressors

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Quarters for the crew are provided below the bridge and in the after part of the vessel. All quarters are heated by steam as is also the main engine room.

The engine room personnel consists of 1 chief engineer, 2 second and 2 third engineers, 3 assistants, 1 storekeeper, 3 oilers and 3 stokers.

### Main Propelling Machinery

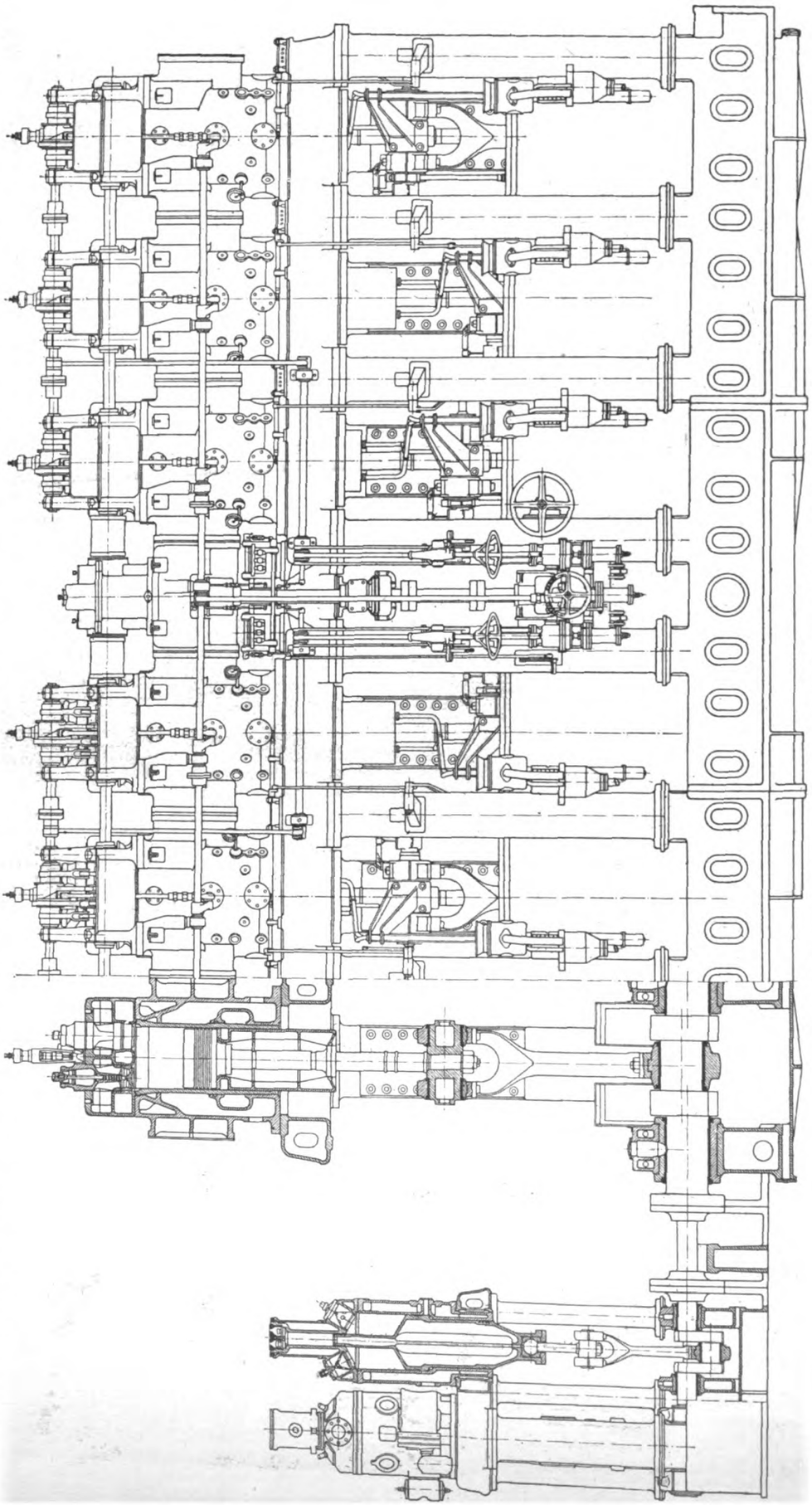
Owing to the easy loading and discharging (from 1 to 2 days) the stay in port for this type of vessel is particularly short and the number of traveling days greater during the year than with other freighters. For this reason, the oil engine plant must be absolutely efficient, the requirement for maximum reliability preceding all others.

The two Germania Diesel engines used to drive the vessel work on the two cycle principle. Their main particulars are as follows:

| | |
|---|---|
| Number of working cylinders | 6 |
| Number of compressor cylinders | 2 |
| Number of scavenging pump cylinders | 2 |
| Diameter of the cylinder | 22.638 inches |
| Normal operating R.P.M. | 106 |
| Piston stroke | 39.37 inches |
| Indicated horsepower of both engines, fully loaded vessel, under above operating conditions | 2,360 |
| Effective horsepower figured on a mechanical efficiency of 0.71 | 1,675 |

The 6 working cylinders are located on a base plate above the columns and connected with each other by strong flanges. The base plate is divided to form 2 three-cylinder blocks between which there is an intermediate piece which takes the upper thrust of the cam shaft, thus assuring the maximum rigidity of the entire engine.

In the cylinders there are fitted special liners



Longitudinal Section and Longitudinal View of Main Engine

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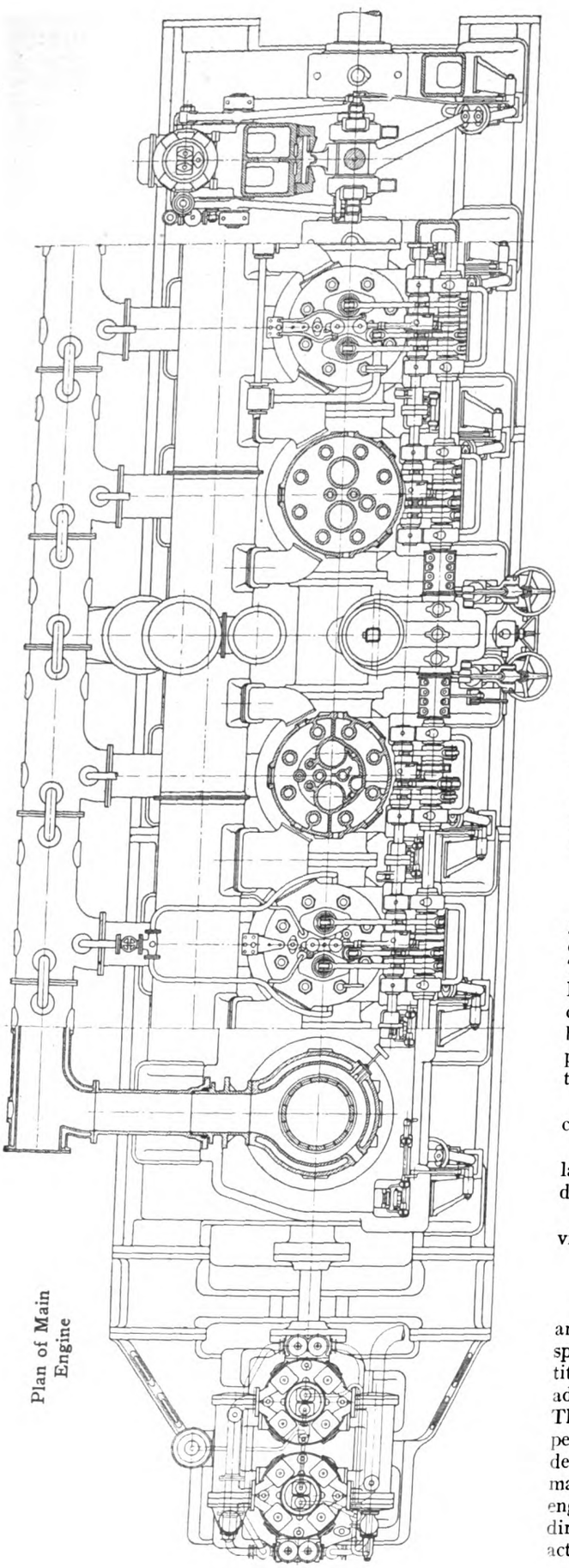

Plan of Main Engine

of the type successfully used in submarine boat engines.

In the cylinder cover there are arranged two scavenging and two fuel valves similar to those of the large submarine four cycle engines which proved very satisfactory in service. There are also provided one starting and safety valve with adequate cross section.

Cam and lever shafts are supported in common bearings placed on the rigid cylinder block. In this manner an exact control of the fuel needles is assured and the roller arrangement of the fuel valve lever, which actuates both valves, can be adjusted in operation, regulating the engine in the shortest possible time so that the indicator diagrams, even in long operation, remain unchanged. In this way the load of the individual cylinders can be made very uniform, which is of importance for trips covering weeks of uninterrupted sailing. Each scavenging valve has its own actuating lever.

The working piston consists of an upper part bearing the rings and a casing to cover the discharge ports. The cooling of the pistons is effected by sea water, which is fed and discharged by means of telescopic pipes.

The compressor (injection pump) is driven by the extended crank shaft. There are two similar cylinders with three-stage pistons with the medium pressure piston under the low pressure. The engine has the usual connecting rods with special crosshead guides. The air of the individual stages in both cylinders is cooled off in pipe nest coolers with suitable separators. The valves of the low and medium pressure stages are plate valves and those of the high pressure stages conical valves.

The two double acting scavenging pumps are driven by means of rocker arms from cylinders 3 and 4 and are provided with plate valves.

For driving the rudder engine, a two-stage rudder air compressor driven by a rocker arm from cylinder 6 is provided to supply compressed air at 8 atmospheres.

Two cooling water and bilge and one deck washing pump are driven by the savenging pump rockers and a fuel supply pump is driven by the rudder air compressor rocker.

### LUBRICATION

Forced lubrication of the main bearings is effected by a geared pump driven by the crank shaft. The lubricating oil is supplied from a tank located in the double bottom. The worm wheels and the rocker bearings also receive forced lubrication. Special force pumps are arranged for the lubrication of the crosshead pins. The lower connecting rod bearings are provided with oil cup lubrication which is also provided as emergency lubrication for the main bearings and the crosshead pins.

For cylinder lubrication there are provided special lubricating pumps of simple and very solid construction.

All the oil flowing from the driving mechanism accumulates in the bedplate and flows to a drain tank located in the double bottom.

As reserve for the connected geared pumps there are provided two electrically driven geared pumps.

### MANEUVERING COMPRESSOR

Despite the very liberal capacity of the compressors, which are directly coupled to the main engines and which at full speed are able to develop a 200 percent addition to the quantity of air normally required for the rudder engine, an additional special Diesel auxiliary compressor is installed. This Diesel auxiliary compressor supplies, at 240 revolutions per minute, three-quarters of the maximum quantity of air delivered by a main compressor. It is used in long continued maneuvering with a low number of revolutions of the main engine and long stops. It also serves as reserve for the directly coupled compressors. The three-cylinder, single acting, four-cycle, driving engine corresponds to a medium

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speed motor type, without piston cooling, which has proven very satisfactory and which has been frequently manufactured for shore plants.

### AUXILIARY MACHINERY

The auxiliaries on a motorship and particularly on a motor tank ship claim special interest. Steam operation of the auxiliary engines has been selected for the *Zoppot* for river navigation and port service, and in view of the justly strict regulations in ports where petroleum and benzine are handled, this solution offers the greatest safety.

Steam is produced in two auxiliary boilers with oil fuel. The fuel oil is vaporized by pump pressure without the assistance of air or steam. The starboard boiler has two and the port boiler three furnaces. Each furnace is fitted with a centrifugal vaporizing nozzle. The fuel oil is forced through one of the pumps, installed in the engine room to supply the fuel oil settling tanks, to a consumption tank whence the oil flows to a small duplex steam pump, or an injector, which forces it to the vaporisers through a filter and heater. For petroleum loading ports in which no boiler fire is permitted, the steam required is supplied to the auxiliary engines through a special piping connection from shore.

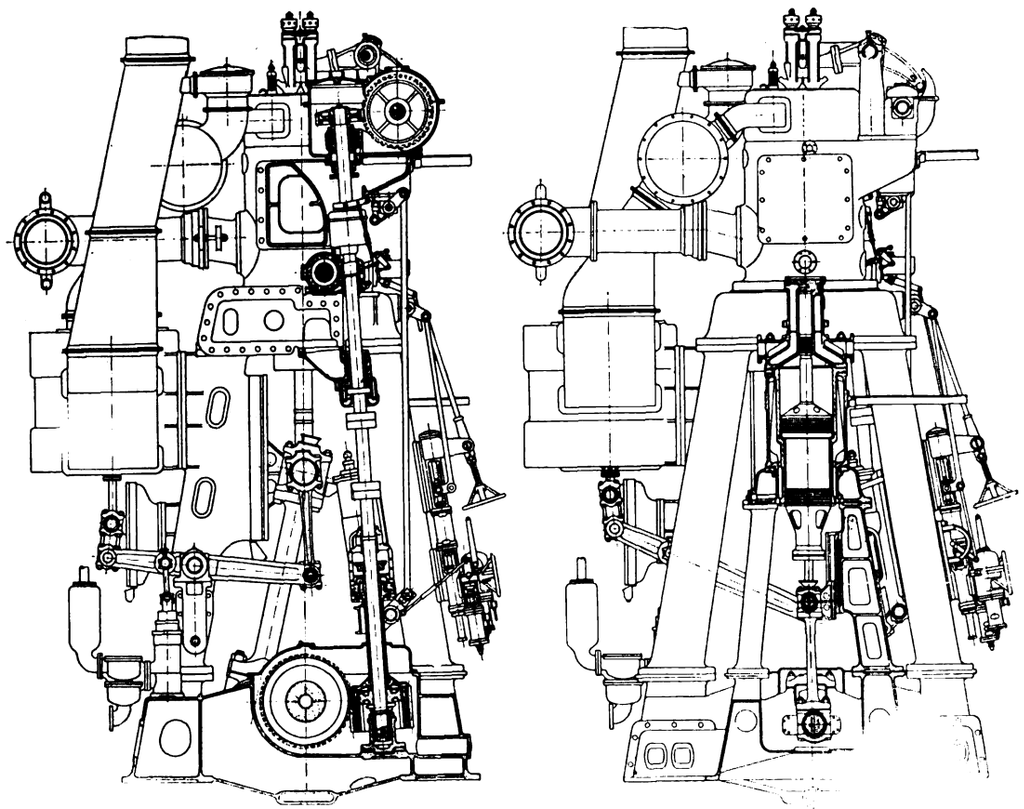
The auxiliary engines of the vessel such as the windlass, warping engines, etc., which are not used on the open sea, are also operated by steam.

The rudder engine is operated at sea with compressed air and in river navigation, where the boiler must be in operation, steam is used. The compressed air for the rudder engine is supplied by a two stage compressor which is attached to one of the two main engines and operated by a lever. The air is stored in a special rudder air container in order to mitigate the pressure fluctuations when shifting the helm. In addition to the provision for switching the rudder engines from air to steam, which is effected at the engine itself, arrangements are made so that compressed air can also be used to drive all steam auxiliaries. This is important in cases of emergency when there is not sufficient time to get up steam. Even the large oil loading pumps have been successfully supplied with compressed air in continuous operation, this compressed air having been supplied by the auxiliary compressor of the Diesel plant. The hand and steam steering apparatus is arranged on the shelter deck in a special wheel house. It has a quadrant, which is coupled with the tiller by means of springs, as well as a rudder brake. The rudder engine is driven by means of a telemotor from the bridge.

To produce the electric current of 110 volts, for power and illuminating purposes, 2 equipments are provided:

1. A dynamo, operated by a 40 horsepower, crude oil engine at 320 revolutions per minute, which is installed in the engine room and

2. A dynamo operated by a two-cylinder compound steam engine of 40 horsepower at 250 revolutions per minute. With the free end of the dynamo shaft an emergency compressor can be coupled, serving to fill the air flasks in case the supply of air should be entirely exhausted. This engine is installed on the second deck adjacent to the boilers.



**Cross Sections of Main Engine**

The additional pumps installed in the engine room are as follows:

Two duplex steam pumps, also equipped for compressed air, for pumping ballast and to act as an addition for cylinder cooling. Capacity of each pump, about 120 tons per hour.

One electrically driven, centrifugal ballast pump.

One electrically driven, centrifugal pump of 35 tons per hour capacity, against a head of 196 feet 10 inches, used chiefly for deck washing purposes.

Two vertical, electrically driven, reserve geared lubricating oil pumps for the main engines with a capacity of 10 tons per hour against a 65-foot 7-inch head.

The exhaust steam of all auxiliary engines operated by steam is led to an auxiliary condenser of 592 square feet cooling surface located on the second deck. The auxiliaries

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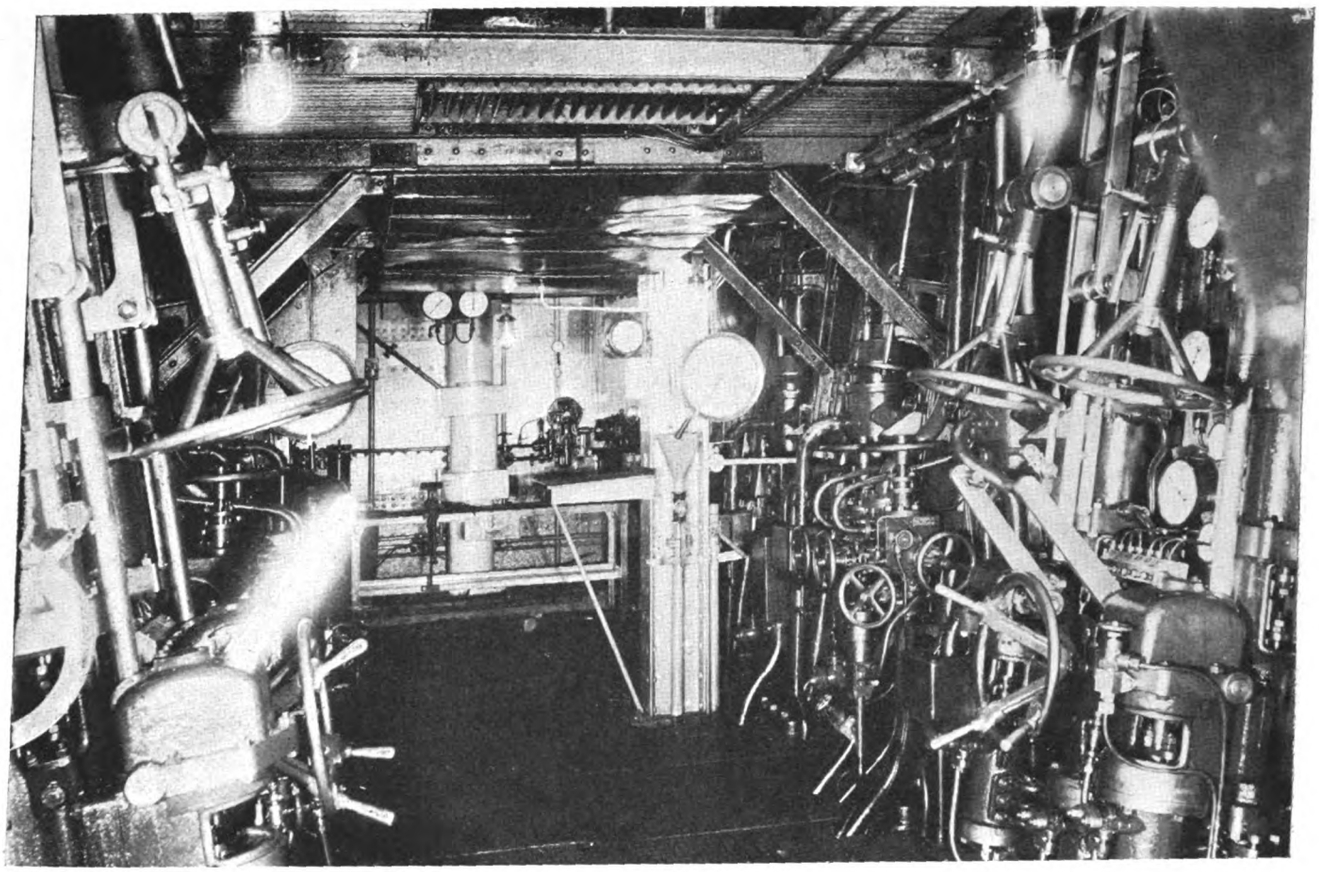

**Operating Station in Engine Room**

can also be operated non-condensing, in order to render possible mixed air and steam operation during the change from one to the other.

On the second deck, alongside the condenser, is an evaporator with a capacity of 15 tons per 24 hours.

Besides the customary apparatus to transmit orders such as the engine telegraph, including reserve telegraph, rudder telegraph, speaking tubes, etc., there is also a system of loud-speaking telephones which connect the bridge, engine room, boiler room and wheel house. This system has proven very satisfactory.

### FUEL OIL

Fuel oil amounting to 900 tons is carried in transverse bunkers forward of the engine room and two tanks built into the structure on the second deck outboard of the engine casing. A small portion of the fuel oil is also carried in the double bottom below the engine room.

Two settling tanks with a capacity of 17 tons each are provided. The settling tanks are served by either a small electrically driven piston pump with a capacity of about 20 tons per hour against a head of 98 feet 5 inches or a duplex steam pump with a capacity of 120 tons per hour.

### OPERATION

The trials of the *Zoppot* were held in July, 1920, and resulted very satisfactorily. Data collected at the trials are as follows:

Vessel loaded so that propellers remained 20 inches under water.
Engines worked quietly with no noticeable vibration amidships.
Average indicated pressure 5.5 atmospheres.
Total indicated horsepower, 3,800.
Injection pressure, 55 atmospheres.
Scavenging pressure, 0.15 atmosphere.
Lubricating oil pressure, 0.7 atmosphere.
The high pressure air left the injection pump with a temperature of 20 degrees C., the various cylinder cooling water outlet temperatures fluctuated between 30 and 35 degrees and that of the piston cooling amounted to 40 degrees C.

A slow test trip was made and the engines were reduced to 50 revolutions per minute when using 6 cylinders and 37 revolutions per minute when using 3 cylinders.

The vessel started on its maiden voyage to New York on July 31, 1920.

During the maiden voyage the daily average revolutions per minute fluctuated between 94 and 103. The lowest ship's run for 24 hours was 237 sea miles, corresponding to 9.7 sea miles speed, and the highest 265 sea miles corresponding to 10.9 sea miles speed per hour. The average speed was 10.53 sea miles with a total distance of 3,838 sea miles and the fuel consumption was as follows:

95 R.P.M. — 3,100 I.H.P. = .329 lbs. per I.H.P. hour
99 R.P.M. — 3,500 I.H.P. = .306 lbs. per I.H.P. hour
105 R.P.M. — 4,000 I.H.P. = .300 lbs. per I.H.P. hour

The reduction in the fuel consumption with increasing power, despite simultaneously increasing length of the operating period, showed that the machines were far from their overload limit and that the combustion always remained entirely satisfactory. Both these factors are of the greatest importance to the life of the engines in practical operation. The actual power limit of the engines is very much higher. In former tests on land, continued power of 6,200 indicated horsepower was obtained.

Since then the *Zoppot* has been in continual service with the exception of a 21-day stay at Ponta Delgada, where after towing in the S. S. *Baltic*, it had to wait for fuel oil, and a stay of 19 days in New York for the installation of heating coils in the cargo oil tanks.

Externally the *Zoppot* has no essential characteristics different from those of a steamer as a funnel of normal size

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is fitted through which the exhaust pipes and the smokestack of the auxiliary boilers are led. The smokestack, during the time it is in operation, has an easily installable spark catcher which is used in oil ports where boiler operation is permitted only if certain measures of precaution are observed.

Two masts are fitted and aside from fulfilling their signal duties, they serve for the suspension of the antennæ for the wireless equipment. Lightning arresters are provided on the masts.

Four lifeboats and a small boat, 18 feet in length, are carried and suffice for a crew of not less than 62 men.

## Independence Tests Her Oil Burners

THE electric drive cargo ship *Independence* made a special trial trip on January 6 for the purpose of determining the evaporative power of her boilers and the efficiency of her oil burners. This vessel, owned by the Shipping Board, which was recently converted into a turbo electrically driven ship at the Tebo Yacht Basin of the Todd Shipyards Corporation, has a deadweight capacity of 11,868 tons on a length of 440 feet. Mr. H. B. Taylor, chief turbine engineer for the United States Shipping Board, was in charge of the trial.

It was the purpose of the trial to determine the steaming power of the boilers rather than the efficiency of the turbine and electrical equipment and, therefore, steam was admitted to all the auxiliary lines including those to the deck winches. Steam also escaped from the safety valve continuously so that any figures given for the consumption of steam by the turbine would be erroneous and misleading. However, it should be noted that the propelling machinery worked with precision and gave no trouble.

The vessel is equipped with three single-ended Scotch boilers fitted with the Peabody-Fisher oil burners, high degree firetube superheaters and Diamond soot blowers. $CO_2$ recorders for determining the quality of the combustion are also fitted.

### The Oil Burners

The oil burners are of the mechanical atomizer type. A special feature of this burner is its power, through a by-pass adjustment, of maintaining the whirling motion which atomizes the oil in the central chamber of the tip undiminished whatever may be the capacity desired of the burner. This is accomplished by diverting or by-passing a part of the oil supply from the central chamber and returning it to the pump suction. In this method the amount of oil which is sprayed into the furnace depends on the proportion of the oil that is by-passed to the total amount entering the burner. With this system the amount of oil entering the central chamber is always the same, so that the whirling of the oil and the atomizing effect remain constant, securing a good spray over a wide range of combustion.

It will be seen from the accompanying table that 55,400 pounds of water were actually evaporated per hour from 1:45 to 4 o'clock and that during this time 4,500 pounds of oil per hour were consumed. This gives an actual evaporation of approximately 12.32 pounds of water per pound of oil but it is to be noted that the temperature of the feed water was only 170 degrees. This low temperature of the feed water was caused by the arrangement of the measuring tanks which were installed on the boat deck. The evaporation per pound of oil from and at 212 degrees Fahrenheit was therefore about 14.85 pounds of water per pound of oil.

Still further, an analysis of samples of the fuel oil showed that there were only 17,931 British thermal units as compared with an average value of 18,500 British thermal units for good oil. With oil having a thermal value of 18,500, the evaporation from and at 212 degrees Fahrenheit would be 15.33 pounds of water per pound of oil, which would give the boiler an efficiency of 80.4 percent.

In connection with the superheaters, attention is called to the high degree of superheat maintained. It is also to be noted that the results obtained in boiler evaporation were materially better after the tubes had been blown than they were in the earlier part of the run. The writer was not at all surprised at this after witnessing the amount of soot escaping from the front of the fireroom while one boiler was being blown and the dense clouds escaping from the stack while the process was going on in the others.

It is estimated that an evaporation of 45,000 pounds of water per hour is sufficient for the requirements of the turbine at full load. During the test, as will be noted, the water actually evaporated was 55,400 pounds per hour. The oil consumed was measured by meter readings and by actual soundings taken from the service tanks. From the official soundings taken during the afternoon the average consumption of oil was found to be 4,500 pounds per hour. The results of the test are shown in the following table:

PERFORMANCE OF PEABODY-FISHER BURNERS. TEST ON S. S. INDEPENDENCE, JANUARY 6, 1922

Engine Room and Fire Room Data and General Notes

| Item | | Time 11:30 | 12:00 | 12:30 | 1:00 | 1:30 | 2:00 | 2:30 | 3:00 | 3:30 | 4:00 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oil (lbs.) pressure | At pump | 178 | 325 | 325 | 325 | 300 | 275 | 300 | 310 | 290 | 300 |
| | At burners | 125 | 200 | 250 | 250 | 225 | 215 | 225 | 225 | 210 | 225 |
| Oil temperature | | 208° | 199° | 275° | 250° | 270° | 255° | 240° | 230° | 246° | 235° |
| Air pressure inches | At fan | 1¼" | 1¼" | 1¼" | 1¼" | 1¼" | 1¼" | 1¼" | 1¼" | 1⅜" | 1⅜" |
| | In wind box | ... | ... | ... | ... | ... | +.30" | ... | ... | +.33" | ... |
| | In front | ... | ... | ... | ... | ... | +.07" | ... | ... | +.11" | ... |
| | In furnace | ... | ... | ... | ... | ... | —.13" | ... | ... | —.12" | ... |
| Steam pressure | Boiler | 210 | 202 | 210 | 215 | 215 | 215 | 215 | 210 | 215 | 215 |
| | Throttle | 200 | 196 | 200 | 205 | 205 | 203 | 210 | 200 | 205 | 205 |
| Steam temp. (°F.) | P. boiler | 560 | 700 | 720 | 720 | 720 | 660 | 676 | 610 | 615 | 615 |
| | C. boiler | 580 | 740 | 760 | 780 | 780 | 700 | 720 | 620 | 640 | 640 |
| | S. boiler | 610 | 770 | 800 | 800 | 790 | 700 | 730 | 620 | 610 | 610 |
| | Throttle | 500 | 620 | 670 | 640 | 640 | 590 | 600 | 550 | 550 | 560 |
| Fire room temperature (°F.) | | 74 | 72 | 74 | 72 | Thermometer moved to center of fire room | | | 84 | 87 | 84 |
| Uptake temperature (°F.) | | 430 | 556 | 580 | 580 | 580 | 520 | 540 | 430 | 430 | 430 |
| Temperature, water (°F.) | M. tanks | ... | 98 | ... | 95 | ... | 91 | ... | 90 | 90 | 88 |
| | Hot-well | 125 | 94 | 85 | 95 | 96 | 102 | 97 | 90 | 100 | 96 |
| | Feed | 178 | 165 | 157 | 178 | 160 | 170 | 176 | 162 | 174 | 163* |
| Shaft r.p.m. | | 90 | 95 | 100 | 100 | 100 | 100 | 100 | 109 | 100 | 100 |
| $CO_2$ (%) | Stack | ... | ... | 12.2 | 12.1 | 12.6 | 11.0 | 11.4 | ... | ... | ... |
| | Tube door | ... | ... | ... | ... | ... | ... | ... | 14.8 | 12.8 | ... |
| Water level in boilers | P. | 11½" | ... | ... | ... | ... | ... | ... | ... | ... | 14" |
| | C. | 6½" | Water level in inches above bottom of gage glass. | | | | | | | | 8½" |
| | S. | 6½" | ... | ... | ... | ... | ... | ... | ... | ... | 13" |

Weather conditions—Clear, moderate winds, sea calm.
Tubes blown—2.40 to 2.55.
By-pass opened to maneuver at 4.11.
Oil used—1.45 to 4.00—4,500 lbs. per hour (official).
Water actually evap.—1.45 to 4.00: 55,400 lbs. per hour (official).
Factor of evap.—1.205. Boiler efficiency—82.5% (official).

*The low feed temperatures were caused by the arrangement of the measuring tanks.

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# Oil Engines Versus Steam for Tugboats

**By H. A. Christensen**

*With a general depression in shipping and thousands of ships being laid up all over the world, a remarkable strength and steadiness has been shown by the motorship, since practically all ships of that type are still in commission and earning good money for their owners. This condition refers not only to ocean-going vessels, but also to the small, but not less important, craft that keep things moving in harbors, rivers and canals. Since numerous articles have lately been written about ocean-going motorships, this article will deal with the development of oil-engined tugboats.*

INLAND water transportation has shown a much steadier condition during the general depression than has transoceanic traffic. In fact a substantial increase in inland water transportation seems imminent. The Ford Motor Company, it is reported, is planning to distribute its product by oil-engined craft and many more will follow suit as soon as the economy of such vessels becomes generally known.

Good examples have been set along these lines by such countries as Holland, Germany and France, where efficient water transportation is of the utmost importance. In spite of the fact that these countries have to import practically all their fuel oil, they have long ago adopted the crude oil motor as the motive power for river and harbor vessels. Although

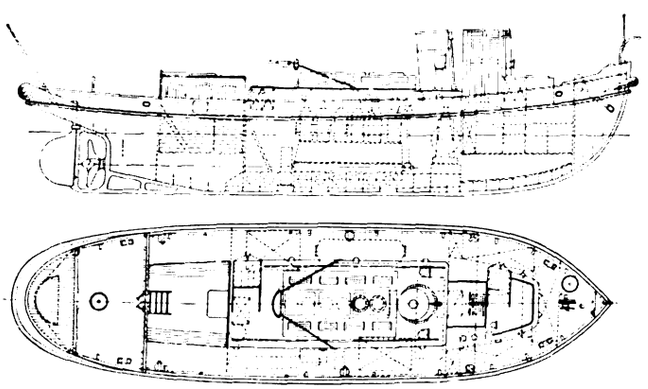

Fig. 1

America is the greatest oil-producing country in the world, we have not yet taken the lead in this respect. The reason is that, during the war, when anything that would float could be operated at a profit, nobody had time to make any changes in their propelling machinery. But conditions have now changed. It will be the owner who has made a thorough study of his problem and who has adopted the most economical form of motive power that will be able to operate his boats at a profit, while competitive boats are laid up.

### Advantages of Motor Tugboats

From actual working data of existing motor tugboats the following advantages for the oil engine have been established:

1. As for large ships, the fuel consumption being between 0.4 and 0.5 pound per brake horsepower hour, the cost of fuel is well below one-half the cost of a steam installation.
2. The weight of an oil engine installation is less than that of a steam installation. This means that the dimensions of the oil-engined tug can be reduced, compared with the dimensions of a steam tug of the same horsepower. This of course means a cheaper boat.
3. Stand-by losses are eliminated in oil-engined tugs, since it takes only a few minutes to start up the oil engine, whereas a steam tug must have the fires burning continuously.
4. Compared with a steam tug of the same dimensions and horsepower the oil-engined tug can carry more fuel and will thus have a greater cruising radius, due to the lighter engines.
5. No firemen are required on an oil-engined tug, giving a saving in the crew's wages.

We shall now describe a few representative tugboats that will substantiate the claims just brought up.

### German Motor Towboat

Fig. 1 shows a Diesel tugboat for harbor service that has been in use at the Government shipyard at Wilhelmshaven, Germany, for over three years. The boat was built by the Hitzler Shipyards at Lauenburg, Germany.

The principal dimensions are:

| | |
|---|---|
| Length overall | 52 feet 6 inches |
| Length between perpendiculars | 45 feet 11 inches |
| Beam | 13 feet 1½ inches |
| Depth | 6 feet 3 inches |
| Draft | 4 feet 7 inches |

A steam tug with the same horsepower would require an addition to the length of about 3 feet and an addition to the beam of about 1 foot due to the larger weight of the steam outfit. This boat is built to the German Lloyds rules and is also designed as an icebreaker.

In order to enable the boat to pass under bridges, the superstructure as well as the smokestack was kept low. Four watertight bulkheads divide the boat into fore peak, crew's quarters, engine room, cabin and after peak.

Instead of a towing engine or towing bitt, as used on many American tugs, a towing hook is used. This hook is located near the center of gravity of the boat, which makes steering easier. This is the more important as most of the towing in Europe is done with the lighters astern of the tug and the practice of making fast alongside of the lighter is hardly ever used.

The machinery consists of one direct reversible two-cycle Diesel engine of 100 brake horsepower. The engine makes 250 revolutions per minute, although it will run smoothly at 70 revolutions.

The engine has four working cylinders, each provided with an independent fuel oil pump and two air pump cylinders placed on the centerline of the engine. The engines are reversed by compressed air from the air tanks, which are of sufficient capacity to reverse the engine twenty times without requiring refilling.

The auxiliary air compressor is driven by a 5 horsepower hot bulb engine that also handles the bilge and fire pump. The cylinders are water cooled by a pump, driven directly from the crank shaft.

The fuel consumption of the main engine using fuel oil of a heating value of about 18,000 British thermal units per pound has averaged 47.4 pounds per hour. The boat can carry fuel oil sufficient for a trip of 500 sea miles. A steam tug of the same size can carry only a few tons of coal, sufficient for about 175 sea miles, on account of the heavier steam installation.

The time used for reversing on the trial trip was about six



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seconds from full speed ahead to full speed astern, and the average speed was nine knots.

### AMERICAN MOTOR TUG

The *Marie L. Hanlon,* one of the first American motor tugs, is shown in Fig. 2. She was built in 1913 by D. J. Hanlon of Oakland, Cal., and is fitted with one direct reversible Bolinder engine of 160 horsepower and 224 revolutions per minute.

A very close comparison with a steam tug could be made in this case as the owner had a steam tug of the same dimensions:

| | |
|---|---|
| Length overall | 71 feet 5 inches |
| Beam | 17 feet 5 inches |
| Depth | 8 feet 5½ inches |
| Draft, average | 6 feet 6 inches |

The steam installation consisted of a Scotch boiler 7 feet 6 inches in diameter and 9 feet long and a compound engine 10 inches by 20 inches by 18 inches. On account of her large engine space the steam tug carries only 18 barrels of oil, which, on a fuel consumption of 42 gallons an hour and a speed of 10½ miles, gives her a steaming radius of only 189 miles. Her sister ship carries 38 barrels of fuel oil and with a fuel consumption of 13.7 gallons per hour she has a radius of 1,565 miles.

The machinery weights in this case are given as 450 pounds per horsepower for the steam installation and 170 pounds for the motor.

The lower fuel consumption and the elimination of the fireman are claimed to bring the operating expenses of the motor tug down to about one-half those of the steam tug.

### DANISH MOTOR TUGBOAT

Fig. 3 shows a Danish wooden tugboat for harbor service. This boat has been in use in the harbor of Copenhagen for the past two years. Its principal dimensions are:

| | |
|---|---|
| Length overall | 52 feet 6 inches |
| Length between perpendiculars | 47 feet 0 inches |
| Beam | 13 feet 0 inches |
| Depth | 7 feet 6 inches |
| Draft | 4 feet 9 inches |

This boat is provided with an 80 horsepower Volund hot bulb reversible engine which makes 250 revolutions per minute.

The fuel consumption of the engine with Solar oil of 18,000 British thermal units heating value is about 43 pounds per hour. The weight of the engine is 180 pounds per horsepower, and it takes exactly eight minutes to start it, from the moment the blow lamps are lighted.

The crew consists of three men and the boat makes an average speed of 9 sea miles an hour.

The absence of auxiliaries and the simple construction as well as lower weight of these engines compare very favorably with Diesel tugs of the same size, whereas the Diesel even in the small sizes has the advantage of a slightly lower fuel consumption. The first cost of a hot bulb engine is lower than that of a Diesel engine.

A steam installation in a boat of this size would take up more than half of the crew's quarters and it would also necessitate a larger deck house.

### FRENCH MOTOR TUGBOAT

Fig. 4 shows a powerful Diesel-engined tugboat built for service on French rivers. Not less than sixteen of these tugs were built during the war by the French Government.

The principal dimensions are:

| | |
|---|---|
| Length overall | 91 feet 10 inches |
| Length between perpendiculars | 85 feet 3 inches |
| Beam | 16 feet 8 inches |
| Draft | 9 feet 10 inches |

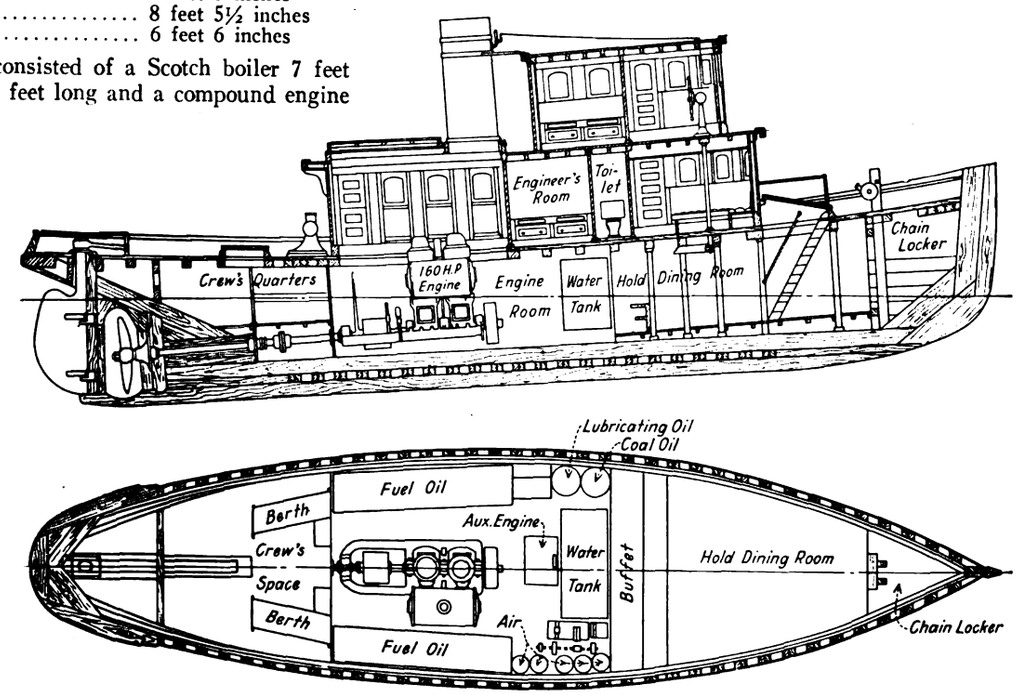


Fig. 2

| | |
|---|---|
| Displacement | 143 tons |
| Fuel capacity, about | 10½ tons |

Ten of these boats are propelled by two-cycle Diesel engines of 420 brake horsepower making about 220 revolutions per minute. The fuel consumption of these engines is 0.38 pound of crude oil per brake horsepower hour. The auxiliary air compressor and the electric lighting are handled by a 12 horsepower Diesel engine. The engines are of the Sulzer design, built by the Forges et Chantiers de la Mediterranee, Paris.

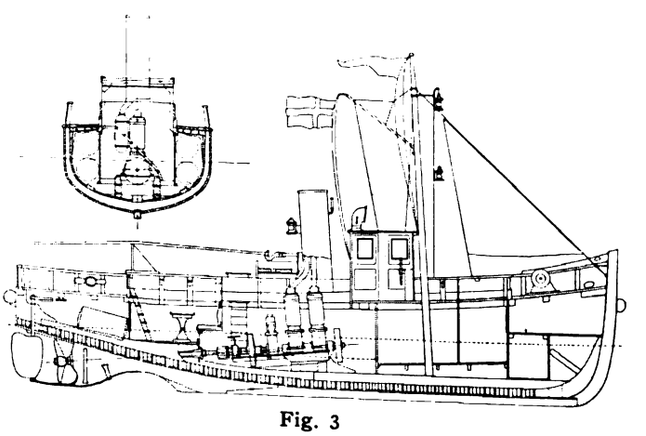

Fig. 3

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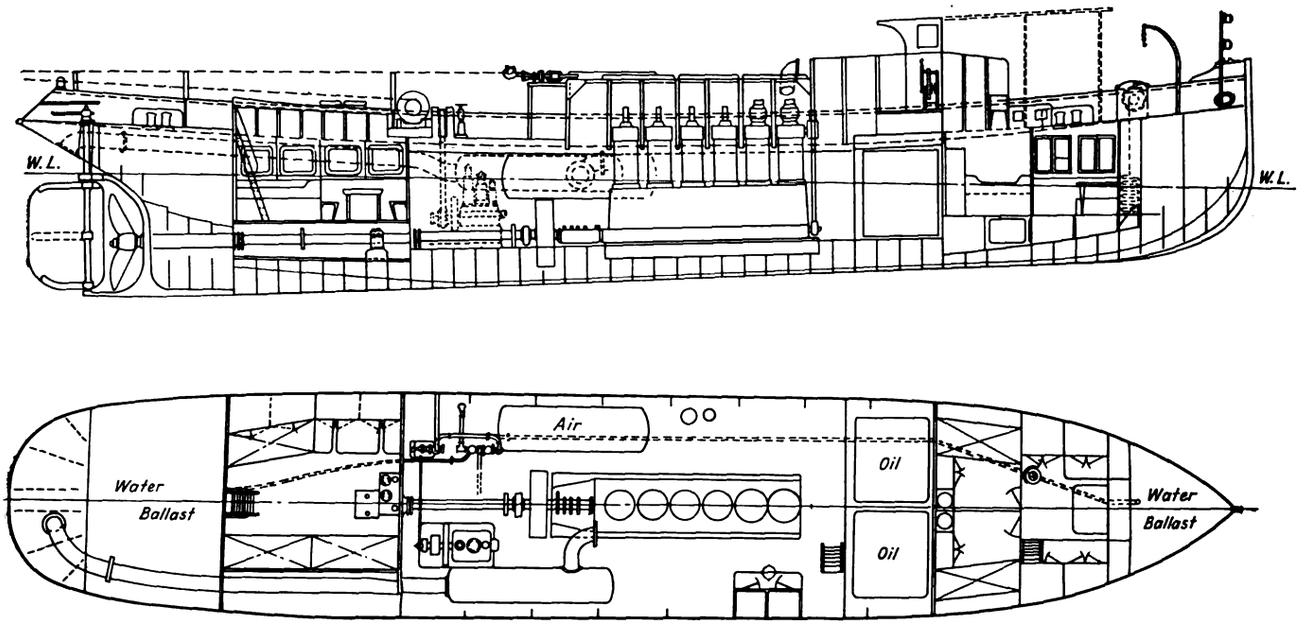


Fig. 4

Six of the boats are propelled by 350 horsepower Polar Diesel engines making 200 revolutions per minute. On account of the smaller engines on these boats their displacement has been decreased by about five tons.

### GERMAN MOTOR TUGBOAT

Fig. 5 shows an ocean-going tug, two of which were built in 1916 by the Atlaswerken in Bremen, Germany.

The principal dimensions are:

| | |
|---|---|
| Length overall | 77 feet 7 inches |
| Length between perpendiculars | 69 feet 6 inches |
| Beam | 18 feet 0 inch |
| Depth | 11 feet 2 inches |
| Draft, aft | 9 feet 6 inches |

The boats were designed for ocean as well as for harbor service. They carry 17.7 tons of fuel oil, giving them a radius of about 2,500 miles. A steam tug with its heavier engine and with the same amount of fuel would require much larger dimensions.

The propelling machinery consists of one two-cycle Diesel engine of 350 horsepower, with 180 revolutions per minute. The steering engine, the windlass and the whistle are handled by compressed air from an air compressor driven by a 30 horsepower Diesel engine. According to the German Lloyds rules the boats also have an auxiliary air compressor driven by a 5 horsepower hot bulb engine.

The smokestack is provided with a number of baffle plates that continuously change the speed and direction of the exhaust gases, thus considerably reducing the noise from the exhaust.

These tugboats, one of which has been in service for seven years, have rendered excellent service. No large repairs have been required during that time.

The engines were built by the firm of Benz & Cie., Manheim.

### SWEDISH MOTOR SALVAGE VESSEL

Fig. 6 shows the Swedish salvage vessel *Fritiof*. Although she is built for salvage work, she possesses all the features of a large ocean going tugboat.

The principal dimensions are given on the following page.

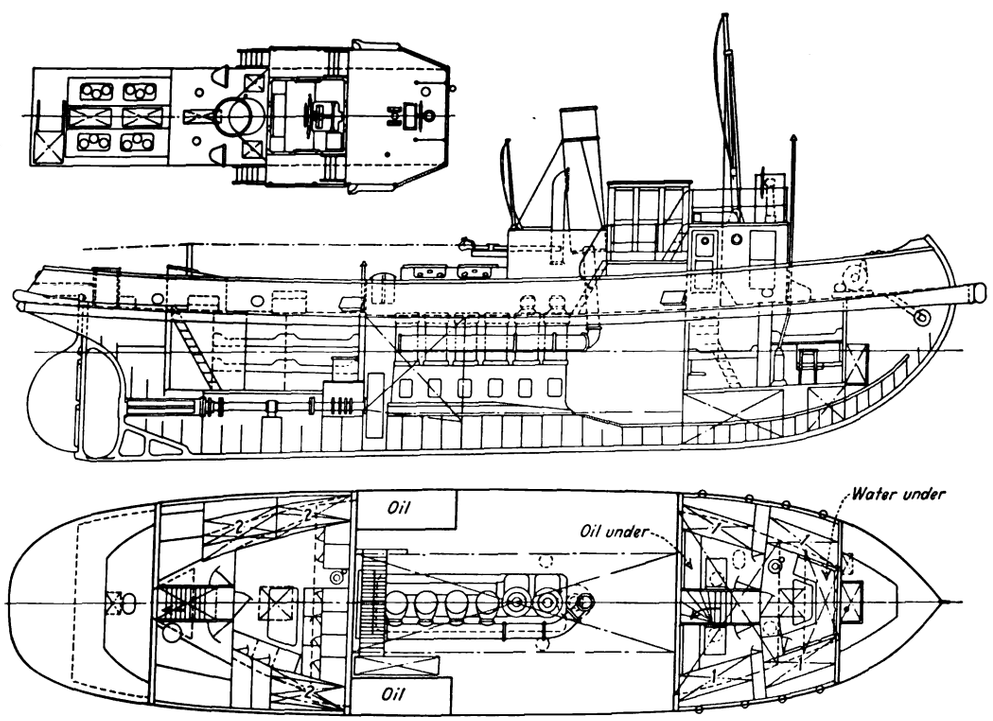


Fig. 5

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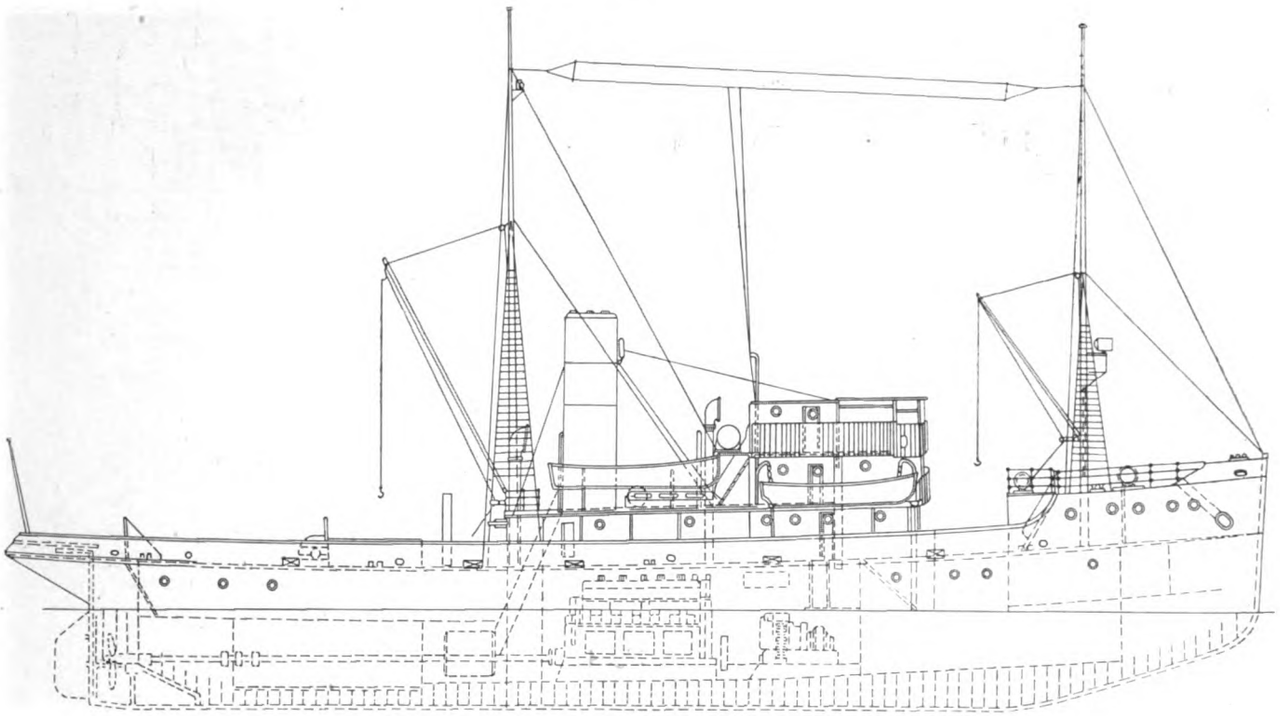

Fig. 6

| | |
|---|---|
| Length between perpendiculars | 156 feet 11 inches |
| Beam | 34 feet 9 inches |
| Depth | 18 feet 7 inches |
| Draft | 13 feet 5 inches |

The machinery consists of two four-cycle Diesel engines of 625 horsepower each, of the Burmeister & Wain type built by Gotaverken, Sweden, and three Diesel engines of 90 horsepower each coupled with a dynamo. Besides the usual auxiliary equipment for a Diesel installation, there are two 14-inch salvage pumps, three 8-inch portable pumps, one 12-inch steam driven pump and two portable plunger pumps. The steering engine, the cargo winches and the towing engine are steam driven. Steam is supplied by one Scotch boiler and one portable boiler.

Built as an icebreaker and with a forecastle giving added seaworthiness she can be looked upon as an excellent all round type of a large ocean going tug.

The principal reason for using motors in this case has been the fact that she will be ready to start on a trip at short notice, a fact that greatly increases her value for salvage purposes. She can also carry more fuel than a steamer of the same dimensions, which is especially important for long distance towing.

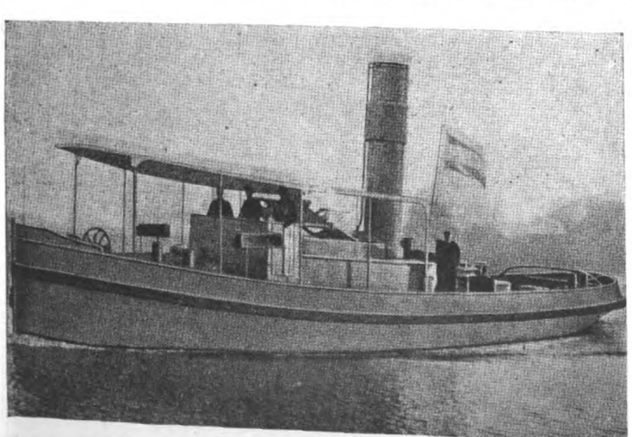

Fig. 7.—East Indian Harbor Motor Tug

### East Indian Motor Tugboat

A small tug for harbor service in the East Indies is shown in Fig. 7. It was built by the shipyard of Nicolaas Witson, Alkmaar, Holland, and is 59 feet 9 inches long between perpendiculars with a beam of 14 feet 9 inches.

The boat is propelled by a two-cycle Diesel engine of 160 horsepower at 250 revolutions per minute. A small hot bulb engine of 6 horsepower at 650 revolutions per minute drives a centrifugal pump in the engine room.

As in all Diesel tugs there is ample room for fuel tanks and, with the approximately 1,300 gallons that she carries, this boat can run over 1,100 sea miles without refilling the tanks.

The awnings which cover the entire forward part of the deck and an extra large engine room skylight are special features for service in the tropics.

### Conclusion

Judging from the data just shown for various oil-engined tugboats in actual use in the principal maritime countries, this type of tugboat certainly offers many advantages over the steam tug. War conditions in shipping have passed, and we are forced to compete with other nations that are not slow to grasp opportunities to decrease their operating expenses. We Americans, with our higher wages and standard of living, should be interested more than anybody else to find ways and means to remove this handicap by adopting equipment that is equal or better than that used by our competitors.

---

George E. Bunting, Australasian manager for the Canadian Government Merchant Marine, Ltd., who will act as general traffic agent for the Canadian National Railways, will have general supervision in New Zealand and Australia of the traffic interests of these railways.

Theodore J. Pick, for several years chief clerk of the Terminal Shipping Company, has been appointed operating manager of the Williams Steamship Company in Baltimore.

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# American Coastwise Motor Tug

By Edward A. Edwards*

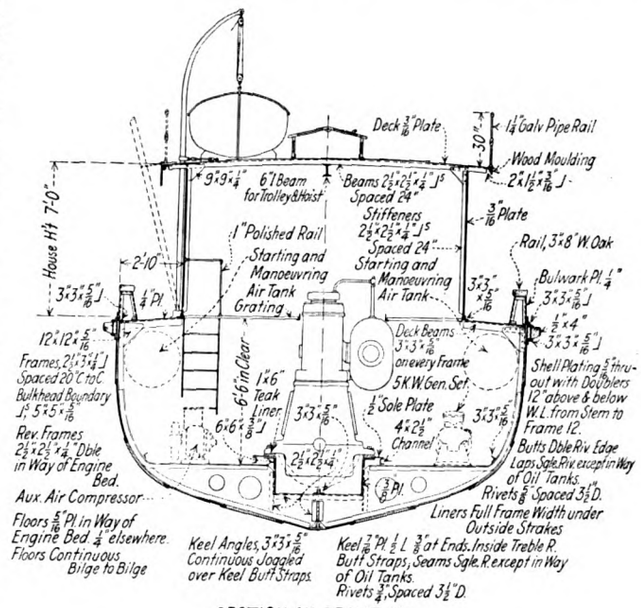
THE very remarkable increase in the use of the oil engine for marine purposes during the past eight years has extended to nearly every type of vessel, large and small, in every kind of service and its great advantages over the cumbersome and far less economical steam plant are being recognized by the operators of tugs, lighters and other small craft which play a more humble though none the less important part in our general system of marine transportation. The steadily increasing number of motor tugs going into service is a pretty sure indication that this type is giving reliable and satisfactory performance along with its undoubted superiority in the matter of operating economy.

The plans show a 300 horsepower motor tug designed by the writer for the Diamond P Boat Line of Philadelphia and intended for general coastwise and inland towing. The draft has been limited to 7 feet for canal work but the boat has plenty of sheer and freeboard so that outside trips can be made with comfort and safety.

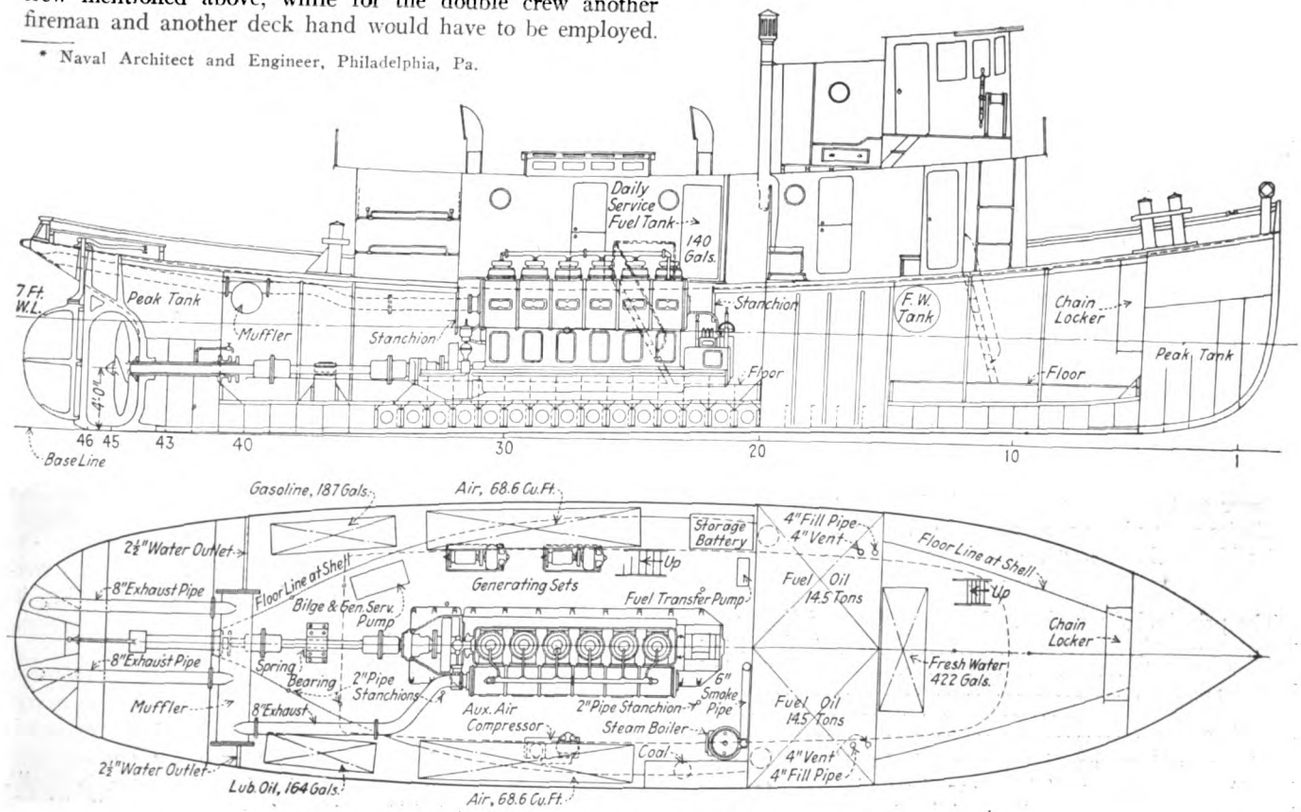
In order to realize fully the advantages of this tug over a steam vessel of the same power it should be noted that, according to the United States Steamboat Inspection Service regulations now in force, a motor vessel used exclusively for towing purposes requires no inspection and no licensed officers. The captain of a boat of this kind, however, would be a licensed pilot in any case. A single crew for the tug shown here consists of only four men; captain, engineer, deck hand and cook, while a double crew for 24 hour service would ordinarily add two more, a mate and an assistant engineer, although one well known boat of this type has been working up and down the coast for the past two years all the way from Florida to Maine with a total double crew of only five men, one of whom acts either as second engineer or deck hand as occasion demands. A steam tug of this size would have to carry two firemen in addition to the single crew mentioned above, while for the double crew another fireman and another deck hand would have to be employed.

* Naval Architect and Engineer, Philadelphia, Pa.

The fuel consumption of the 300 shaft horsepower main engine is approximately 22 gallons per hour at full load, so that with 30 tons of oil in her bunkers this tug can run at full power for over 400 hours. Working 10 hours per day this means that the boat will require bunkering only once in forty days, while in 24 hour service she can be run at full power for 17 days. These figures should be interesting to the owner of the average steam tug which loses practically half a day every five or six days in filling up her coal bunkers.


Deck 3/16" Plate
1 1/4" Galv Pipe Rail
Wood Moulding
House Ht 7'-0"
Beams 2 1/2"x2 1/2"x1/4" L's Spaced 24"
Stiffeners 2 1/2"x2 1/2"x1/4" L's Spaced 24"
1" Polished Rail
Starting and Manoeuvring Air Tank Grating
Deck Beams 3"x3"x5/16" on every Frame
5 K.W. Gen. Set
1"x6" Teak Liner
3/8" Sole Plate
4"x2 1/2" Channel
Rail, 3"x8" W. Oak
Bulwark Pl. 1/4"
Shell Plating 5/16" throut with Doublers 12" above & below W.L. from Stem to Frame 12.
Butts Dble Riv. Edge Laps Sgle. Piv. except in Way of Oil Tanks.
Rivets 5/8" Spaced 3 1/2" D.
Liners Full Frame Width under Outside Strakes
Frames, 2 1/2"x3 1/2"x1/4" L's Spaced 20" C to C
Bulkhead Boundary L's 5"x3 1/2"x5/16"
Rev. Frames 2 1/2"x2 1/2"x1/4" Dble in Way of Engine Bed.
Aux. Air Compressor
Floors 5/16" Pl. in Way of Engine Bed. 1/4" elsewhere. Floors Continuous Bilge to Bilge
Keel Angles, 3"x3"x5/16" Continuous Joggled over Keel. Butt Straps.
Keel 7/16" Pl. 2 L's 3"x3"x5/16" at Ends. Inside Treble R. Butt Straps, Seams Sgle. R. except in Way of Oil Tanks. Rivets 3/4" Spaced 3 1/2" D.
SECTION ON FRAME 24.

**Midship Section of American Motor Tug**




**Design for 300 Horsepower American Motor Tug**

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# American Coastwise and Inland Motor Tug

### General Information

**Service:** Towing .....
.....
.....
**Builder:** .....
.....
.....
**Owner:** Diamond P Boat Line, Pier 45, N. Wharves, Philadelphia.....

### Characteristics

| | |
|---|---|
| Length, overall | 82′ 6″ |
| Length, B. P. | 73′ 6″ |
| Breadth, molded | 18′ 6″ |
| Depth, molded | 9′ 0″ |
| Draft, loaded | 7′ 0″ |
| Draft, light | |
| Block coefficient | 0.454 |
| Midship section coefficient | 0.711 |
| Longitudinal coefficient | 0.638 |
| Speed, loaded, knots | |
| Cruising radius, nautical miles | |
| Framing | Transverse |
| Class | |
| | |

### Tonnages

(In tons of 2,240 pounds)

| | |
|---|---|
| *Weight of Hull | 70 |
| **Weight Propelling Machinery | 27 |
| Deadweight Capacity | |
| Displacement | 123.5 |

(In tons of 100 cubic feet)

| | |
|---|---|
| Gross register | |
| Net register | |

*Weight of Hull includes Hull Proper, Hull Fittings, Equipment, and Outfit.
**Weight of Propelling Machinery includes Engines, Boilers (Wet), Shafting, Propellers, and Machinery Space Auxiliaries.

### Equipment

| | | |
|---|---|---|
| Anchors: | 1 | 500 lbs. |
| | 1 | 250 lbs. |
| | | |
| | | |
| Chain: | 60 fathoms | 11/16″ S. L. |
| | 60 fathoms | ½″ C. L. |
| | | |
| | | |

### Rudder

| | |
|---|---|
| Area | 19.41 sq. ft. |
| Dia. Stock | 3″ |
| C. Press. abaft C. L. pintles | 21″ |

### Complement

| | |
|---|---|
| Deck officers | 2 |
| Deck crew | 1 |
| Engineer officers | |
| Engineer crew | 1 |
| Purser's and steward's department | 1 |
| Total officers and crew | 5 |

### Deck Machinery

| | |
|---|---|
| Steering Gear | Hand |
| | |
| Windlass | |
| Capstans | |
| Winches | |
| | |

### Life Saving Equipment

| | No. | Type | Length |
|---|---|---|---|
| Lifeboats | 1 | steel | 14′ |
| | | | |
| | | | |

### Engines

| | |
|---|---|
| Number | 1 |
| Type | Moderate Compr. Oil |
| Size | 6 cyl., 14″ bore, 18″ stroke |
| Horsepower, shaft | 300 |
| Normal fuel consumption, main engine: | |
| Per day, tons | 1.8 |
| Per horsepower hour, pounds | 0.56 |

### Propellers

| | |
|---|---|
| Number | 1 |
| Type | 4-blade |
| Weight | |
| Diameter | 72″ |
| Pitch | 56″ |
| R. P. M. | 250 |
| Projected area | |
| Developed area | |

### Auxiliary Machinery

**Machinery Space**

.....
Pumps:
One 2″ Blackmer rotary bilge and general service pump direct connected to 3 h.p. electric motor.
.....
One ¾″ Blackmer rotary fuel transfer pump direct conected to ½ h. p. electric motor.
.....
One 4½x5 air compressor driven by 5 h.p. electric motor.

**Electric Equipment**

Generators:
Two 5 K.W. sets for driving auxiliaries and for lighting.

### Bunkers

| Compartment | Cu. Ft. | *Bbls. | *Tons |
|---|---|---|---|
| Port | 580 | | 14.5 |
| Starboard | 580 | | 14.5 |

*40 cu. ft. per ton;.....gals. per bbl.

In addition to the above outlined advantages it should be remembered that the motor tug is always ready for instant service, there being no time loss while getting up steam. In addition there are no stand-by losses, no ashes to handle, no dirt and no choked bilges to clean out.

One of the features of this boat which should have special mention, and which overcomes one of the most frequently raised objections to the motor tug, is the Sperry electro-magnetic clutch which will probably be installed for the purpose of securing added flexibility and maneuvering power. This clutch is a recent development of the Sperry Gyroscope Company and is installed in place of the flywheel on the after end of the main engine, adding practically nothing to the space and very little to the weight. It requires less than three amperes of current at 110 volts to transmit the full power of the engine. The transmission is through an air gap, not by any clamping of plates, thus giving that perfect flexibility which is the main advantage of the electric drive. The current through the clutch coils is controlled by a rheostat placed close to the other engine controls and also in the pilot house if desired, enabling either the pilot or the engineer to bring the propeller shaft from zero up to full revolutions, or vice versa, as gradually as may be desired and with absolute freedom from jar or shock.

#### Hull

The principal dimensions of the tug are as follows:

| | |
|---|---|
| Length, overall | 82 feet 6 inches |
| Breadth, molded | 18 feet 6 inches |
| Depth, molded | 9 feet |
| Draft with 28 tons fuel | 7 feet |
| Shaft horsepower | 300 |

The scantlings are in excess of American Bureau or Lloyd's requirements. There are four oil tight transverse bulkheads, two forming the peak tanks and two the main fuel bunkers. The fuel compartment is also divided by a centerline longitudinal bulkhead into port and starboard tanks, the combined capacity of which is 29 long tons. Additional fuel may be carried in the peak tanks and two daily service tanks are located in the engine room.

#### Machinery

The main propelling unit is a 6 cylinder, 14-inch bore, 18-inch stroke, Fairbanks Morse type C-O direct reversible oil engine, conservatively rated at 300 brake horsepower at 250 revolutions per minute. This engine is of the moderate compression, two stroke type with mechanical injection.

The auxiliaries are all electrically operated and consist of one 4½ by 5 Ingersoll-Rand Imperial Type 14 vertical reservoir cooled air compressor connected by short belt drive to a 5 horsepower, 1,150 revolutions per minute Fairbanks Morse type CPB motor; one 2-inch Blackmer rotary bilge and general service pump geared to a 3 horsepower, 1,150 revolutions per minute Fairbanks Morse type CPB motor and one ¾-inch Blackmer rotary fuel transfer pump geared to a one-half horsepower, 1,750 revolutions per minute General Electric type RC motor. All motors are 110 volt direct current, which is supplied by two 5 kilowatt Winton gasoline engine driven generating sets. One of these sets is sufficient for ordinary use and the other is held in reserve.

A slate panel switchboard with circuit breakers and controls for motors and lights is located above the grating in the upper part of the engine room. There is also a 56 cell, 110 volt storage battery for auxiliary lighting purposes.

Starting and maneuvering air at 175 pounds pressure is carried in two tanks, one on each side of the engine room.

A small coal burning steam boiler for heating purposes is located in the forward starboard corner of the engine room.

The complete tug as shown in the plans can be built, fully equipped and delivered to New York or Philadelphia for approximately $60,000 at the present time.



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# Motorship With a Non-Reversing Engine

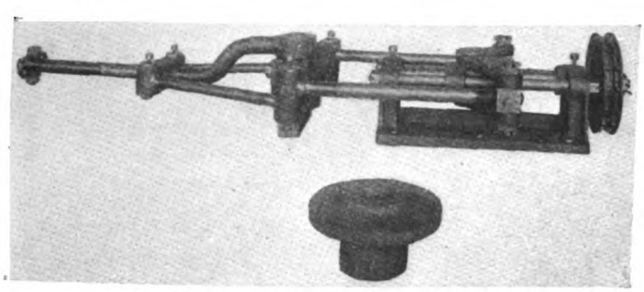
## Maneuvering Ability Supplied by Kitchen Rudder, the Alca Completes Year of Uninterrupted Service in Congested Harbors

By Alexander McNab*

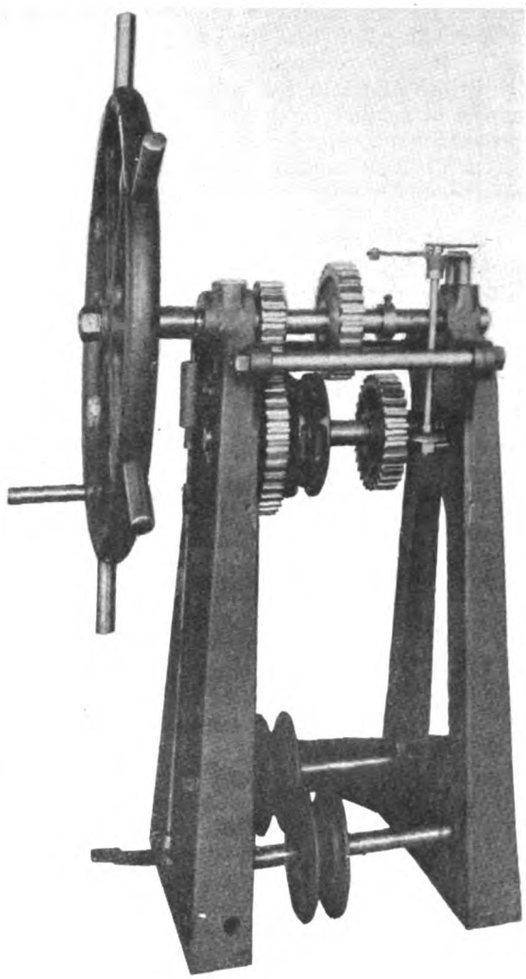
THE economical advantage of the direct Diesel driven ship is evident by the success already attained. The greatest testimony to ships of this class is the number in successful operation today; voyages are undertaken and marine conditions accepted without any trepidation because of the machinery installed.

When Dr. Rudolf Diesel brought out his first engine it was of the land type, being non-reversible. It was therefore natural that marine engineers went to work to make this type of engine reversible before it could be successfully applied to ship propulsion. It may seem preposterous, at this late date, to state that, if more consideration had been given the ship's rudder, there is every reason to believe that the reversing of the reciprocating, turbine or Diesel engine need never have been considered. As a matter of fact, however, vessels equipped with Kitchen rudders, which accomplish the reversal of the ship without reversing the engine, are now being successfully operated.

Stern of Motorship Alca, Showing Kitchen Rudder



Steering Gear of Motorship Alca



Steering Wheel of Motorship Alca

### Features of Kitchen Rudder

The essential parts of the Kitchen rudder consist of two curved deflectors, which partially enclose the propeller, both of which are pivoted on top and bottom on common centers. By suitable mechanism, similar in design to the electric-hydraulic type of steering gear, the deflectors or rudders are made to turn together in the same direction or equally in opposite directions. The operation of the rudders is arranged by remote control installed on the bridge, this control can be electric or telemotor.

Over three hundred Kitchen reversing rudder installations have been made and it has been found, from data taken on a

*President of The McNab Company, Member Institute of Marine Engineers.



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number of different classes of vessels in operation ranging from the tow boat up to and including the ocean motor freighter, that the maneuvering and steering ability of each ship so equipped is identical.

With this new type of rudder the Diesel engine or steam turbine can be made non-reversible and directly connected to the propeller shaft. During the time that the propeller is rotating full ahead the vessel, fitted with the Kitchen rudder, can be held stationary as if at anchor, can be sent ahead at a speed ranging from the fraction of a knot to maximum speed or can be brought from full speed to dead rest in approximately her own length without shock or strain to rudder, hull or machinery. A single screw ship can be rotated on her own axis to port or starboard without progression, which maneuver is impossible with any other type of rudder, and with propeller running full ahead the vessel is capable of an astern speed of from 28 percent to 35 percent of her ahead speed. The British Admiralty has installed these rudders in a large number of auxiliary craft and, from data taken, it has been reported that the speed of each vessel fitted has been increased from 3 percent to 6 percent over that of the standard type of rudder.

### The Motorship Alca

An example of this new form of rudder, as installed on the motorship *Alca*, may be of interest, especially when it was considered doubtful that the installation would be a success due to the low powered land type propelling unit installed. The vessel, however, has now been in continual service for over one year between the Bay of Biscay and Mediterranean ports. The *Alca* is a steel vessel of 500 tons displacement and 300 tons deadweight carrying capacity engaged in carrying coal and general cargo. Her dimensions are as follows:

| | |
|---|---|
| Length | 140 feet |
| Beam | 22 feet 3 inches |
| Depth, molded | 10 feet |
| Load draft | 8 feet 3 inches |

Engine, Sulzer Diesel land type (non-reversing), 150 brake horsepower direct connected to a propeller 4 feet in diameter.

The *Alca* was originally built as a sailing vessel; she has now been rerigged and fitted with cargo booms. To install the Kitchen rudder the original rudder post was removed by cutting through at the top and bottom of the propeller aperture, an extension to the stern foot to take the bottom pintle was added and a strong gudgeon was riveted to the hull to receive the rudder stock. The rudder blades are of mild steel plate ½ inch thick, the inside dimensions of the rudder being 64 inches by 58 inches, the major axis being horizontal. The maneuvering and reverse control for operating the rudders is installed in the pilot house. The ordinary type of hand steering wheel is used, this being independent from the maneuvering control. The remote control as installed on the *Alca* is operated manually, power gear not being necessary owing to the low engine brake horsepower and small diameter propeller. The motion from this control is conveyed to the rudder head operating gear by means of steel chains over guide sheaves and rollers; it is this gear which regulates the opening and closing of the rudder blades, thereby regulating the ahead and astern speed of the ship.

During her trials the *Alca* attained a sea speed of 6¼ knots. The following results of maneuvering are interesting:

From full ahead to dead stop, time taken 34 seconds and distance traveled 200 feet.

Diameter of turning circle, rudder 25 degrees hard over at full speed ahead, 140 feet.

Time taken to spin on own axis, as if on a pivot, without progression through half circle, 1 minute 25 seconds.

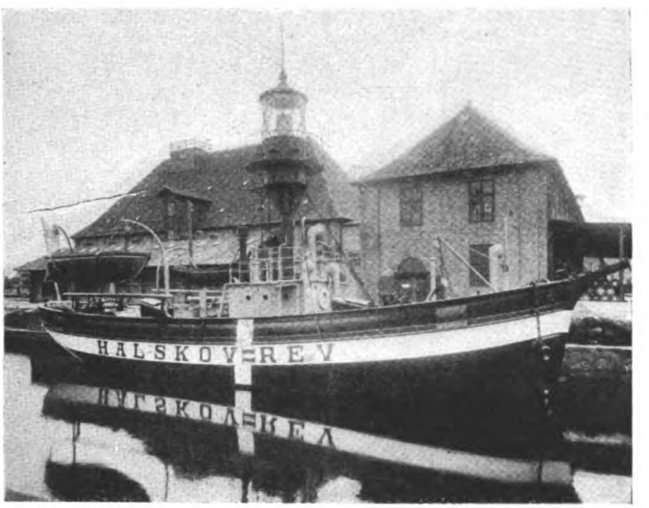
The owners of the *Alca* report that during the first year of uninterrupted service the rudder control is most efficient and practically instantaneous in effect.

## New Danish Motor Lightship

**By H. C. Snethlage**

In view of Secretary Hoover's emphatic report that sixteen new lightships are urgently needed, as mentioned in the January issue of this magazine, it will prove interesting to American readers to see photographs of an up-to-date Danish lightship provided with crude oil engines.

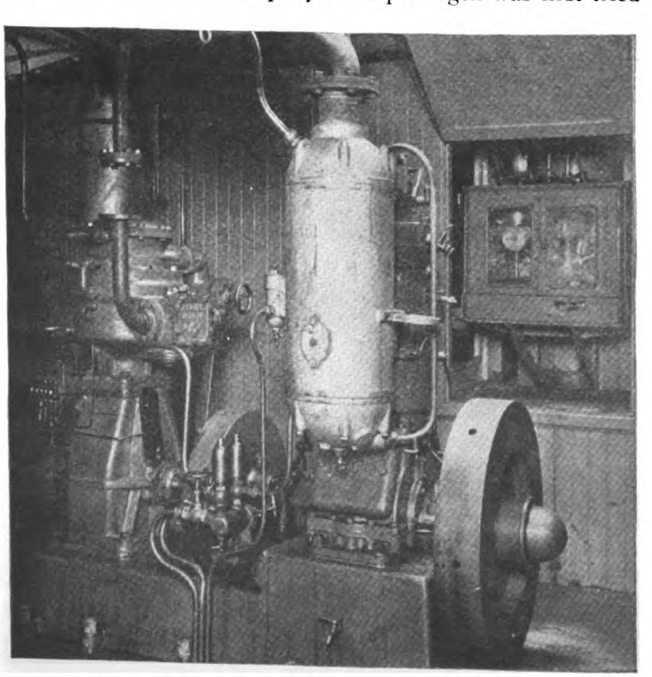
This installation is another proof of the absolute reliability of the crude oil engine for marine purposes. The seas around Denmark are very stormy. Ask any captain who has passed




**Motor Lightship Halskov-Rev**

the "Skaw" on a stormy winter night. And since the power plant on a lightship is apt to be used on just such a stormy night, it is evident that no chances can be taken with machinery that is not absolutely reliable.

Due to the success of large motor merchant ships in Denmark, the Danish lighthouse service decided to investigate if that type of motive power could not be used to advantage on their ships. An 80 horsepower Volund motor manufactured by the Volund Company of Copenhagen was first tried



**Motor Compressor for Lightship Fog Horn**

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out on one of the smaller lighthouse vessels, and since this engine proved satisfactory in every way, all Danish lightships are now provided with that type of motor.

The main propelling machinery consists of a 135 horsepower crude oil motor. It is of the two-cycle, valveless, trunk piston type with a hot bulb, used for ignition, placed on top of the cylinder. An interesting feature of this installation is that no water injection is used. The weight of the machinery is only about 180 pounds per horsepower, which compared with 400 pounds for a steam installation gives a saving of 12 tons in displacement for the motorship.

Not only is the main propelling machinery motor driven but the fog horn is handled by an air compressor direct connected to a 27 horsepower one-cylinder Volund motor as shown in Fig. 2.

This lightship is stationed off the west coast of Jutland, not far from the spot where the greatest naval battle in history was fought. This coast line is not unlike our Atlantic coast line in that there are plenty of opportunities for ships to go on the rocks. The Danes, however, are taking no chances. Equipment as good as can be had is placed in this service. Is there any reason why this country, with resources many times greater than Denmark's, should stand back and let the lives of thousands of people depend on out-of-date lightships, some of which are over 50 years old?

Now is the time when Congress should take action. We have shipyards here second to none. Why should these yards be allowed to be temporarily idle, when new construction of such vital importance to American shipping could easily be done now, thus keeping the highly trained shipyard organizations intact?

We hope that Congress will see this point and that in the near future, lightships of the most modern type will be under construction in our shipyards.

# Fire Tube Superheaters Save Fuel on Railroad Tugs

## Indicated Horsepower Increased from 5 to 27 Percent—Fuel Consumption Reduced from 15 to 17 Percent—Maintenance Costs Negligible

FUEL economy, increased capacity, greater operating efficiency and freedom from maintenance troubles—advantages claimed for the fire tube superheater—have been convincingly established by the successful operation of high degree superheat on the sea-going tugs *Wyoming, Perth Amboy* and *Lehigh,* formerly owned by the Lehigh Valley Railroad and now owned and operated by the Bee Line Transportation Company.

The *Wyoming,* a vessel of 398 gross tons, 152 feet long, 27 feet 3 inches beam and 16 feet draft, with a towing capacity of 5,000 tons, was the first American boat operating in American waters to be equipped with fire tube superheaters. The *Wyoming* was fitted with superheaters in June, 1915, by The Superheater Company (then the Locomotive Superheater Company), New York.

### Economies Effected

In November, 1916, after a series of operating tests on the *Wyoming* had shown a coal saving of 15⅝ percent and an increase in capacity of from 865 indicated horsepower on saturated steam, to 908 indicated horsepower on superheated steam, a second tug, the *Perth Amboy,* was equipped with the same type of superheaters.

Similar and even more careful tests were run on the *Perth Amboy,* and the results compared with saturated steam operation under identical conditions. Superheated, the *Perth Amboy* developed 887 indicated horsepower against 775 indicated horsepower on saturated steam. A fuel saving of 15 percent was shown.

The *Lehigh,* the third of the fleet, was equipped with the same kind of fire tube superheaters in March, 1917. The *Lehigh,* after superheating, developed 803 indicated horsepower against 633 indicated horsepower on saturated steam. On the *Lehigh,* the fuel saving proved to be 17 percent.

### Maintenance Costs Practically Nil

Any doubts as to the practicability of the fire tube superheaters for use on this type of vessel are removed by the performance and maintenance records of these superheater-equipped tugs. Over considerable periods of continuous operation, six years in the case of the *Wyoming,* five years on the *Perth Amboy,* and upwards of four years on the *Lehigh,* maintenance costs on the superheater equipment of these vessels have been practically nil.

No trouble has been experienced through the use of cylinder lubrication. The *Perth Amboy* has run two and one-half years on one set of rings in the high pressure cylinder with 180 degrees of superheat. All three ships average 60 to 70 hours on one quart of oil in the forced feed lubricator. Recent examination of the rods, rings and cylinder liners of these superheated tugs showed them to be in excellent condition.

**Tug Wyoming, on Which the Installation of Fire Tube Superheaters Cut Down the Fuel Consumption Over 15 Percent**

Comparative performances of the Lehigh tugs on saturated and on superheated steam are shown in Table I.

### Description of the Superheaters

The fire tube superheater, as installed in the Lehigh Valley Railroad tugs, consists of three pairs of collector castings or headers, located at the uptake end of the boiler, each pair of headers being connected to a group or nest of superheater unit pipes, which run in and out of the boiler smoke tubes. Of each pair of headers one takes the saturated steam as it comes from the boiler and transfers it to the superheater units; the other receives the superheated steam after it has passed through the units on its way to the engines.

In this superheater there is a total of 80 units, arranged in three groups, corresponding to the number of pairs of headers. These groups, each made up of a saturated and a superheated header, with a system of units, are independent in their action, being separated from each other by valves.

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TABLE I—COMPARATIVE PERFORMANCES, SATURATED AND SUPERHEATED STEAM, OF LEHIGH VALLEY RAILROAD COMPANY'S TUGS IN TOWING SERVICE

| | Lehigh | | Perth Amboy | | Wyoming | |
|---|---|---|---|---|---|---|
| Duration of Test | Sat. Steam 46.92 hr. | S. H. Steam 85.50 hr. | Sat. Steam 47.58 hr. | S. H. Steam 54 hr. | Sat. Steam ..... | S. H. Steam 138.58 hr. |
| Number of barges | 3 | 4 | 3 | 3 | 3 | 3 |
| Total tonnage of tow | 3,451 | 5,149 | 3,322 | 3,502 | ..... | 3,251 |
| Boiler pressure (lb. sq. in.) (av.) | 173 | 173 | 186 | 187.5 | 175* | 175* |
| M. E. P. H.P. Cyl. (lb. sq. in.) | 76.9 | 95.2 | 63.5 | 82.8 | 79.9* | 79* |
| M. E. P. I. P. Cyl. (lb. sq. in.) | 33.8 | 37.6 | 40.6 | 39.7 | 33.3* | 36.5* |
| M. E. P. L. P. Cyl. (lb. sq. in.) | 9.8 | 12.55 | 13.7 | 15.4 | 10.4* | 12.5* |
| Ref. M. E. P. | 32.3 | 38.6 | 37.9 | 42.5 | 33.7* | 37.1* |
| Vacuum (inches) (av.) | 23.5 | 23.4 | 24.3 | 24.8 | 26* | 25* |
| R. P. M. | 87.7 | 92.3 | 93 | 94.8 | 117* | 111* |
| I. H. P. | 633 | 803 | 775 | 887 | ..... | ..... |
| Max. I. H. P. (no tow) | ..... | ..... | ..... | ..... | 865* | 908* |
| I. P. Rec. Pres. (lb. sq. in.) (av.) | 53.8 | 58.4 | 72 | 65.7 | ..... | ..... |
| L. P. Rec. Pres. (lb. sq. in.) (av.) | 5.9 | 6.85 | 16.4 | 15.4 | ..... | ..... |
| St. Temp. at throttle (av.) | 376 F. | 575 F. | 382 F. | 590 F. | 377 F. | 570 F. |
| St. Temp. at throttle (max.) | 376 F. | 625 F. | 382 F. | 608 F. | 377 F. | 590 F. |
| Draft (stack base) (in.) (av.) | .34 in. | .34 in. | .31 in. | .28 in. | ..... | ..... |
| Temp. flue gas (stack base) (av.) | 527 F. | 385 F. | 456 F. | 362 F. | ..... | 444 F. |
| Temp. feed water (av.) | 233 F. | 230 F. | 222 F. | 224 F. | ..... | 207 F. |
| Temp. hot well (av.) | 118 F. | 112 F. | 117 F. | 119 F. | ..... | 120 F. |
| Temp. L. P. Rec. (av.) | 229 F. | 233 F. | ..... | 244 F. | ..... | ..... |
| Fuel | Anth. Coal | Anth. Coal | Anth. Coal | Anth. Coal | Anth. Coal | Anth. Coal |
| Fuel, B. T. U. per lb. | 12,758 | 11,166 | 12,483 | 12,423 | ..... | ..... |
| Fuel, per hr. lb. | 1,450 | 1,520 | 2,024 | 1,968 | 1,428 | 1,205 |
| Fuel, per hr. per sq. ft. grate | 16.15 | 16.85 | 18.6 | 18.1 | 16.5 | 13.9 |
| Fuel, per I. H. P. hr. | 2.29 | 1.90 | 2.61 | 2.218 | ..... | ..... |
| Fuel economy, percent | ..... | 17% | ..... | 15% | ..... | 15¼% |
| Indicated thrust | 17,650 | 21,300 | 20,272 | 22,900 | ..... | ..... |
| Hull dimensions | 136 x 26 x 13-4 | | 140 x 29 x 16-5 | | 140 x 27 x16 | |
| Hull, gross tons | 446 | | 452 | | 398 | |
| Engine, type | Triple Expansion | | Triple Expansion | | Triple Expansion | |
| Engine, dia.-cyls. | 16 9/16" x 25¼" x 43¼" | | 17½" x 25" x 43" | | 17" x 25" x 43" | |
| Engine stroke | 30" | | 30" | | 30" | |
| Boiler—Type | S.E. Scotch | | S.E. Scotch | | S.E. Scotch | |
| Boiler, number | One | | One | | One | |
| Boiler, pressure, allowed | 180 lb. sq. in. | | 190 lb. sq. in. | | 180 lb. sq. in. | |
| Boiler, number furnaces | Four | | Four | | Four | |
| Boiler, grate area (total) | 90 sq. ft. | | 108.5 sq. ft. | | 86.6 sq. ft. | |
| Boiler, total evap. surface | 3,066 sq. ft. | | 3,228 sq. ft. | | 2,926 sq. ft. | |
| Boiler, draft | Natural | | Natural | | Natural | |
| Propeller, number blades | Four | | Four | | Four | |
| Propeller, diameter | 10' 0" | | 10' 6" | | 10' 0" | |
| Propeller, pitch | 13' 6" | | 13' 6" | | 13' 6" | |

*Light vessel, no tow

### High Degree Superheat Successful

The degree of superheat obtained can be governed by a mixing pipe, which keeps the superheated steam at any desired temperature by admitting the proper amount of saturated steam to the main steam pipe. The average steam temperature obtained with this superheater is about 565 degrees, which, with a steam pressure of 180 pounds, is equivalent to 185 degrees of superheat. A maximum steam temperature of 620 degrees, corresponding to 240 degrees of superheat, has been successfully maintained.

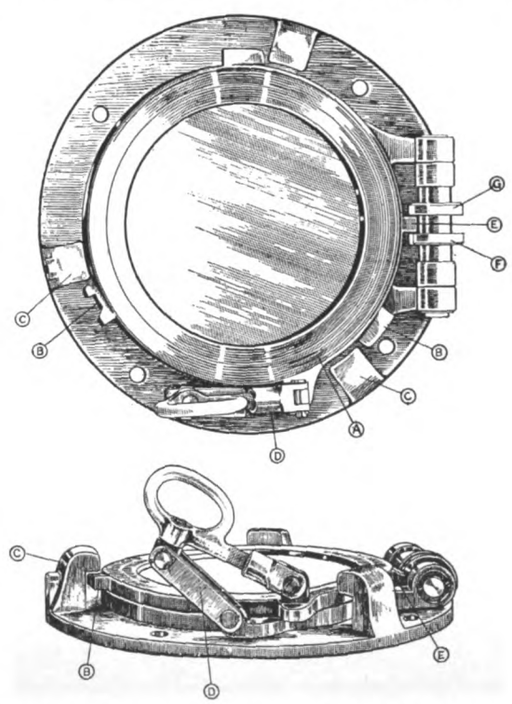
High degree superheat and fire tube superheaters have been employed extensively in European marine service for many years. It is interesting to note that the first American shipowner to equip a vessel with fire tube superheaters was an American railroad on which high temperature superheat and superheaters had come to be regarded as essential to efficient, economical locomotive operation.

## Automatic Locking Safety Port Hole

THE "Smithson" safety air ports with which the *Olympic* is equipped are now being manufactured in the United States by the Mercantile Specialties Company, 11 Broadway, New York. Rapidity of closing is a special advantage claimed for the port and this is accomplished without the use of a spanner or key. The port is provided with an automatic lock which is arranged so that the port can be left under the control of the passenger when desirable or locked by simply removing a special key.

The mechanism of the port consists of a rotating ring *A* by means of which the port is fastened. This ring carries a series of wedge blocks *B* which engage under lugs *C* on the base frame, when the port is closed. The pressure of the ring on its rubber seat is uniform and eliminates the possibility of cracked glass and strains on the porthole frame. The ring is rotated by means of toggle *D*.

In opening the port, a toggle handle is raised until the ring has rotated sufficiently to allow the stop *E* to pass through the slot in collar *F* and bring up against the collar *G* which prevents further movement and allows the port to open. To close the port, the handle is simply moved down,




**Port Hole with Lugs Disengaged Ready for Opening**

when the stop *E* passes through the slot in collar *F*, allowing the rotating ring to move and engage the wedge blocks under the lugs.

In England the device has been approved by the Board of Trade for all classes of ships.

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# Canvas, Bunting and Felt for Shipbuilding Purposes

**By Horace Holden Thayer***

*Continuation of a series of articles containing information regarding shipbuilding materials and their uses that is not readily obtainable from shipbuilding handbooks and other generally available sources. The articles are not intended to be a complete exposition of the subject but will be found to contain items of value to the various classes of workers in this field who have to deal with these materials from the materials point of view.*

THE canvas of principal value for shipbuilding purposes is cotton duck and the heavier weights of cotton duck are always sold by number, hence the material is known to the trade as Number Canvas.

## Number Canvas

It is customary to call for cotton duck when specifying canvas for sails and frequently some well known and thoroughly tried out brand is designated, but it is not so well understood that practically all of the canvas used about a ship should be of this material, including deck coverings and the less important covers for items of equipment exposed to the weather.

The nature of Number Canvas and the usual requirements which govern the production of this material are embodied in the Navy Department detail specifications for cotton canvas, and can probably be best and most concisely stated by the following excerpts from these specifications. The warp threads run lengthwise of the piece and the filling threads run at right angles to the warp threads.

*Quality.*—The canvas shall be made of cotton of a grade not inferior to middling cotton thoroughly cleaned, with yarn evenly spun. The thread shall be twisted multiple ply, the number of ply to depend upon the weight and number of the canvas. The fabric shall be properly woven and as free from lumps, knots and imperfections of manufacture as the best commercial grades of canvas.

*Width and Length.*—The canvas shall be uniformly woven with even and straight selvages to the full width specified, an excess width of ¼ inch being allowed. The width of any bolt shall be uniform throughout its entire length. Two-thirds of any delivery shall have a length of at least 90 yards per bolt. Shorter lengths, ranging from 45 yards up, will be acceptable, but not more than one-third of any delivery shall consist of short-length bolts.

*Tests.*—The strength of the material shall be determined as follows: (a) Test pieces will be prepared by cutting samples 8 inches long by 1¼ inches wide and then pulling out threads from both sides of the narrow section of warp test pieces until three threads remain on each side of a standard width of 1 inch. All filling test pieces will have threads pulled out until a standard width of 1 inch is reached.

(b) Five test pieces from the warp and a like number from the filling taken within the selvage will be dried for one hour at a temperature of 150 degrees F.

(c) The test pieces immediately upon removal from the drying oven will be placed in the jaws of a testing machine with jaws 3 inches apart and pulled to rupture at a rate of 20 inches per minute.

*Strength, Etc.*—(a) The strength of no one of the five test pieces cut from either the warp or the filling of the same bolt shall be less than the average strength of the five by a greater amount than 10 percent of that average.

(b) The strength and other physical characteristics of the material shall be as follows.

A table follows which gives the standard weights of the canvas per linear yard under normal atmospheric conditions, from which a variation of 2 percent calculated from the weight of an entire bolt is permitted, gives distances of the customary blue warp thread from the edge, ranging from 1 inch on the No. 10 canvas to 1¾ inches on the No. 1 canvas, and gives the minimum strengths allowable. These strengths, in pounds, are:

| | Warp | Filling |
|---|---|---|
| No. 1 | 160 | 200 |
| No. 2 | 150 | 190 |
| No. 3 | 145 | 180 |
| No. 4 | 140 | 170 |
| No. 5 | 135 | 150 |
| No. 6 | 125 | 140 |
| No. 7 | 120 | 115 |
| No. 8 | 105 | 105 |
| No. 9 | 100 | 105 |
| No. 10 | 95 | 95 |

Number Canvas is made hard, medium and soft in all numbers to 6 inclusive and all lighter canvas is hard. The hard is the tightest weave, most waterproof and best for deck covering and covers generally. The medium is best for sails as it is not so stiff and difficult to handle when wet. The soft is not needed for shipbuilding purposes.

The numbers range from 12/0, which is extremely thick and heavy, to 1/0 or 0, and thence on down to No. 12, which is the lightest and has a two thread warp and a two thread filling. The numbers most met with in shipbuilding are 0 to 6, although large sails are sometimes made as heavy as 2/0. No. 0 is about .055 inch thick and one yard 22 inches wide weighs 19 ounces. No. 6 is about .043 inch thick and one yard 22 inches wide weighs 13 ounces. It will be noted from this that in the 22-inch width the weight varies one ounce with each number. In order to compare the weight of Number Canvas with that of any canvas which is sold by weight it is only necessary to divide the even ounces of the Number Canvas which apply to the 22-inch width by 22 and to multiply by the width in inches which forms the basis for the ounces, or the weight per yard, of the other canvas. The table given below, which shows the weights of Number Canvas for the standard widths of Army Duck and Ounce Canvas, will be found of convenience in this connection.

Weight Per Linear Yard in Ounces

| Width in Inches— | 22 | 28.5 | 29 |
|---|---|---|---|
| No. 0 | 19 | | |
| No. 1 | 18 | | |
| No. 2 | 17 | | |
| No. 3 | 16 | | |
| No. 4 | 15 | | |
| No. 5 | 14 | | |
| No. 6 | 13 | | |
| No. 7 | 12 | 15.5 | 15.8 |
| No. 8 | 11 | 14.2 | 14.5 |
| No. 9 | 10 | 13.0 | 13.2 |
| No. 10 | 9 | 11.7 | 11.9 |
| No. 11 | 8 | 10.4 | 10.5 |
| No. 12 | 7 | 9.1 | 9.2 |

Standard widths for sail duck are 22 inches to conform to the practice in this country and 24 inches to conform to the practice in England. These widths are often used for deck covering and in other places where narrow strips are desirable. Number Canvas from numbers 1 to 12 can be obtained in widths from 6 inches to 144 inches.

*Member of the firm of Rossell & Thayer, Naval Architects and Marine Engineers, Philadelphia, Pa.



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### ARMY DUCK

Army Duck is of the same weave as Number Canvas, both the warp and the filling threads being twisted. These threads are lighter than those of the Number Canvas and the material is therefore of a tighter weave and even more waterproof than the Number Canvas. It was designed particularly for the making of tents.

Army Duck is graded by weight, which tends to confuse it with Ounce Canvas. The standard width is 28½ inches and the weights per linear yard at that width are 7, 8, 9, 10, 12 and 15 ounces. It can also be obtained in a 37-inch width weighing 10.38 ounces per linear yard and in a 40-inch width weighing 11 ounces, and greater widths are made to order.

The writer understands that the Navy canvas which they call Ravens is this Army Duck. Ravens is incorporated with duck in the Navy detail specifications for cotton canvas and the requirements for it are identical with those before quoted under the heading of Number Canvas except that the bolts are not required to be over 65 yards in length. The width is 28½ inches and the minimum strengths allowable, in pounds, are:

| | Wrap | Filling |
|---|---|---|
| 8-ounce | 80 | 55 |
| 10-ounce | 100 | 65 |
| 12-ounce | 105 | 95 |
| 15-ounce | 125 | 115 |

### OUNCE CANVAS

Ounce canvas, which derives its name from the fact that it is graded by weight, is of a different weave from Number Canvas. The warp consists of two threads which lie side by side untwisted, and the filling is either a single or a multiple thread, the latter being twisted. The two kinds go by the names of single filled or double filled canvas, and both unfortunately often also go by the name of duck. The double filled canvas of any weight is of tighter weave and is stronger and more waterproof than the single filled canvas, but it is not the equal in strength or watertightness of true cotton duck.

The weights are based upon a standard width of 29 inches and no other width can be readily obtained. They are 7, 8, 9, 10, 12 and 15 ounces per linear yard, and the single filled canvas can also be obtained in a 6-ounce weight.

The double filled canvas is of value for cushion covers and similar service. The single filled canvas for shipbuilding purposes can be considered only as a cheap substitute for the double filled canvas.

### ENAMELING DUCK

Enameling Duck is the trade name for canvas that is made like the double filled Ounce Canvas, of a standard weight of 8 ounces per linear yard 38 inches wide, or two yards to the pound. It can also be obtained in greater widths, all of the same thickness and of correspondingly greater weights. These widths and their weights are as follows:

| | | |
|---|---|---|
| 38-inch | 8 | ounces |
| 46½-inch | 9.8 | " |
| 51½-inch | 10.8 | " |
| 57-inch | 12 | " |
| 61-inch | 12.8 | " |
| 72-inch | 15.2 | " |

This canvas is of value for pipe and boiler coverings, the 38-inch width being used mainly for the former and the greater widths for the latter.

A single filled canvas of this nature may be obtained but as with the regular run of Ounce Canvas it is only a cheap substitute for the double filled canvas.

### HOSE DUCK

Hose Duck is of the same construction as Number Canvas, with twisted warp and filling threads, but it is of a looser weave and softer. It comes in a standard width of 40 inches and in weights of 10, 12, 14, 16, 18, 20 and 22 ounces per linear yard. It can be obtained in greater widths to order.

As its name implies, it is used in the manufacture of hose. It is also of value for pipe coverings.

### OTHER CANVAS, ETC.

There are other special types of canvas, but they seldom or never find their way into the shipbuilding field; and there are other cloths which may be substituted in some cases for canvas. One of the latter which it may be of value to refer to is a cloth made of flax, imported from Belgium, which when waterproofed makes an excellent material for the covers and side cloths of deck lighters and similar service, being very durable and pliable as well as of a tight weave.

### WATERPROOFING CANVAS

Canvas is waterproofed mainly by concerns who make that their special business and who treat it with some solution which is their particular property. Suitable compounds of this nature can be obtained by shipbuilders and sailmakers who may desire to do their own waterproofing, but the general practice except for small hurry-up jobs is to leave this work to specialists in this line.

Canvas covers are sometimes specified to be paraffine coated. Although this tends to preserve the canvas it is poor practice from a waterproofing standpoint because it flakes off with the moving about of the covers and with cold and does not stand up under any considerable heat.

### USES FOR CANVAS

Some of the more important uses for canvas on shipboard as well as a suitable weight of canvas for the particular service are listed in the following table. Where a number alone is given it is the number of Number Canvas. The sails of large sailing vessels as listed are those of the barkentine illustrated by the accompanying plan, and their locations may be readily determined by reference to the corresponding numbers of canvas on this plan. These weights will form a fair guide for the weights of sails in similar locations generally.

**List of Sails for a Barkentine**

| | Number or Weight of Canvas |
|---|---|
| SAILS OF LARGE SAILING VESSELS | |
| Fore staysail | 1 |
| Fore topmast staysail | 1 |
| Inner jib | 2 |
| Outer jib | 3 |
| Fore sail | 0 |
| Lower top sail | 0 |
| Upper top sail | 1 |
| Top gallant sails (2) | 3 |
| Royal | 4 |
| Main staysail | 2 |
| Middle staysail | 3 |
| Main topmast staysail | 4 |
| Main sail | 0 |
| Mizzen sail | 1 |
| Jigger sail | 1 |
| Spanker | 2 |
| Gaff topsails | 4 |
| Ringtail topsail | 5 |
| SAILS OF SCHOONER BARGES | 2 |
| SAILS OF STEAMSHIPS | 3 |
| SAILS OF SMALL VESSELS | 4 to 12, according to size |
| LIFEBOAT SAILS | 11 |
| TARPAULINS | |
| Weather deck hatches | 2 |
| Tween deck hatches | 4 |
| Lighter covers and side cloths | 2 |

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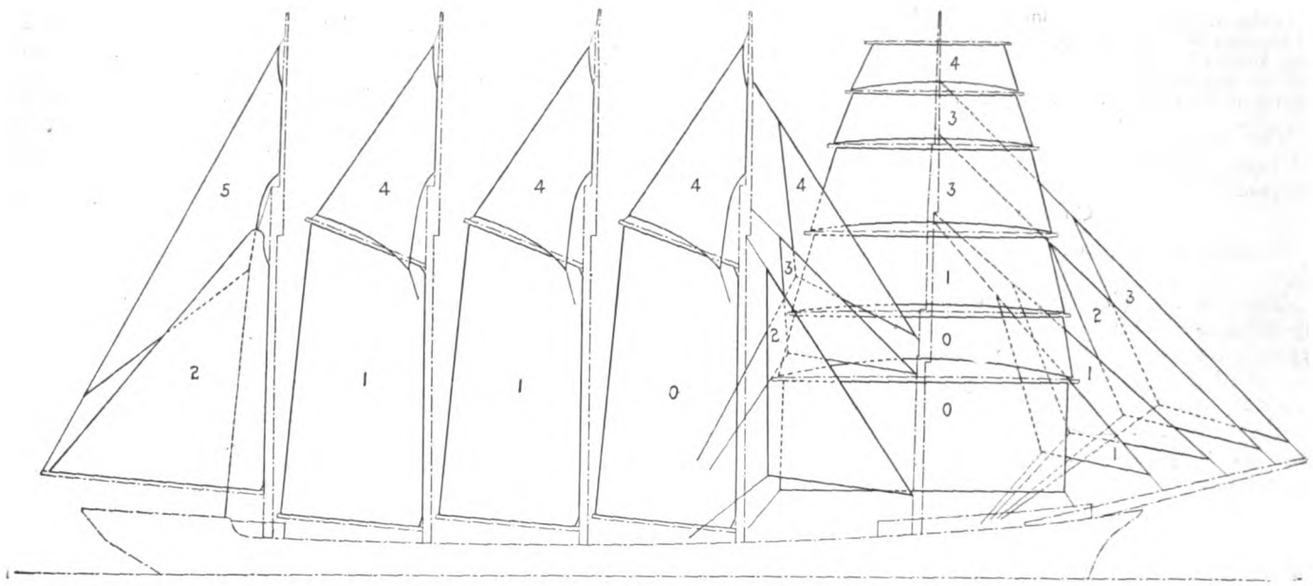


**Sail Plan of Barkentine**

| | |
|---|---|
| AWNINGS, ETC. | |
| Awnings generally | 3 |
| Pilot house visors | 4 |
| Weather cloths | 4 |
| Dodgers | 6 |
| Crows nest | 6 |
| DECK CANVAS | |
| Decks generally | 2 |
| Top of pilot house and similar locations where there is no traffic | 4 |
| WEATHER COVERS | |
| Bells | 8 |
| Binnacles | 6 |
| Boat fall gear | 6 |
| Capstans | 4 |
| Engine telegraphs | 6 |
| Gun covers | 4 |
| Hawser reels | 6 |
| Lifeboats, single | 5 |
| Lifeboat nests | 4 |
| Mast coats | 2 |
| Sail covers | |
| Large sails | 5 |
| Small sails | 8 to 12 |
| Searchlights | |
| Large installations | 4 |
| Small installations | 6 |
| Skylights | 2 |
| Sounding machines | 6 |
| Steering gears | 4 |
| Steering wheels | 6 |
| Ventilator cowls | 6 |
| Ventilator plugs | 6 |
| Winch covers | 4 |
| Windlass covers | 3 |
| Work boats | 6 |
| UNDERDECK COVERS | |
| Electrical machinery | 12-ounce Army Duck |
| Switchboard | 8-ounce Army Duck |
| Miscellaneous portable covers | 12-ounce Double Filled |
| MISCELLANEOUS | |
| Bags | 4 |
| Cots | 7 |
| Hammocks | 1 |
| Pipe and boiler covering | 8-ounce (for 38-inch width) Enamelling Duck |
| Sea anchors | 6 or heavier |
| Swimming tanks | 0 |
| Upholstery | 8-ounce Double Filled |
| Wind sails | 4 |
| Wood watertight bulkheads | 6 |

## WOOL BUNTING

The only bunting of real value in the marine field is Wool Bunting and its nature and the requirements that it should live up to may be best stated by quoting from the Navy Department detail specifications for this material.

*Quality.*—Wool bunting shall be made entirely of the best quality of wool, well woven, finished, of good workmanship, and free from all defects and blemishes which may affect the appearance or serviceability of the fabric.

*Construction.*—The yarns shall be well and evenly spun; both warp and filling shall each contain not less than 34 threads to the inch; the warp shall be two-ply and the filling one-ply, properly twisted.

*Width and Weight.*—The bunting shall be fully 18 inches in width. The weight shall be not less than 5¼ pounds avoirdupois per piece or bolt of 40 yards.

*Strength.*—The average strength of the material shall be not less than 25 pounds per inch of width of warp and not less than 18 pounds per inch of width of filling, based on test pieces prepared and tested as follows:

(a) The test pieces will be prepared by cutting samples 8 inches long by 1¼ inches wide and then pulling out threads from both sides of the narrow section until the standard width of 1 inch is reached.

(b) Ten test pieces, 5 from the warp and 5 from the filling taken from various parts of the fabric within the selvage, will be dried for 1 hour at a temperature of 150 degrees F.

(c) Immediately upon removal from the drying oven, the test pieces will be placed in the jaws of a testing machine with jaws 3 inches apart, and pulled to rupture at the rate of 20 inches per minute.

*Comparison with Standard Sample.*—Deliveries shall be equal or superior in quality, finish and all other respects to the standard samples, portions of which may be obtained from the navy yard at which delivery is to be made; color shades of deliveries shall conform to the standard sample of bunting on hand at the navy yard, New York, and tests of colors as outlined in paragraph 7 below shall be made upon samples taken from deliveries and from standard samples on hand at the navy yard, New York.

*Tests of Colors.*—Colors shall be fast and stable when exposed to light or the action of fresh or salt water. When samples taken from deliveries and from the standard sample on hand at the navy yard, New York, are subjected to the same tests, the results of the tests upon the delivery shall be at least equal to the results obtained upon the standard sample in immersion in fresh water, salt water, exposed to the rays of a quartz-burner mercury-vapor lamp, and exposure to the weather for 10 days, of which not less than 30 hours shall be bright sunlight.

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*Packing.*—Each bolt of bunting shall contain at least 40 yards of bunting, shall be neatly and evenly rolled upon a wooden roller, and wrapped in paper. The wrapping shall be closed at each end by a paper label of the color of the bunting, and shall be plainly marked with the quantity in the bolt.

The only important use for wool bunting is in the making of flags of all kinds. It is sometimes used for decorative purposes.

### Cotton Bunting

Cotton Bunting is a poor material and the colors are not fast.

The fact that the Navy Department has prepared detail specifications for Cotton Bunting along the lines of their specifications for Wool Bunting might lead to the conclusion that the former can be used for flags with satisfactory results. This is, however, not the case. The specifications were prepared in 1917 as a war emergency measure on account of the difficulty in obtaining Wool Bunting in sufficient quantities.

### Sheathing Felt

The sheathing felt used for various purposes about a vessel, as a backing for wood or metal sheathing on a wood hull, or for canvas on joiner decks, between the layers of double wood bulkheads, as a calking material, etc., is a product which is imported from Ireland. It is made of flax or jute, cow hair and pine tar. It comes in sheets about 1/16-inch thick and 32 inches by 36 inches and 32 inches by 40 inches in size, which are packed in crates containing 250 sheets each.

The Navy Department detail specifications for tarred sheathing felt state that it shall be made from jute or flax saturated with approved resinous or tarry material, that it shall be delivered in sheets about 32 by 40 inches, and that it shall weigh not less than 2 nor more than 3 ounces per square foot.

Imitations of this felt are produced by one or more of the paper mills in this country, but such of this product as has come to the attention of the writer is very inferior and undesirable for shipbuilding purposes.

### A Few Suggestions

Specify Number Canvas, or its equivalent in the lighter weights, for all service where strength and waterproof qualities are important.

Use a well tried make or have the material tested.

In dealing with canvas that is named by weight be sure of the width to which the stated weight has reference.

Use narrow widths, 14 inches to 20 inches, for sails of yachts and other small vessels as these are easier to handle and will lie better.

Canvas should be waterproofed when it is to be used for the top tarpaulin on weather deck cargo hatches. These hatches should preferably have three tarpaulins on them, all of the same weight.

Waterproofed canvas should be used for deck cargo covers.

Canvas swimming tanks should be double, the outer canvas being waterproofed. The inner canvas should also be waterproofed were it not for the oily nature of the coating used.

Canvas for dynamo covers should be waterproofed.

Canvas covers are usually not required for deck machinery such as the windlass, winches and capstans.

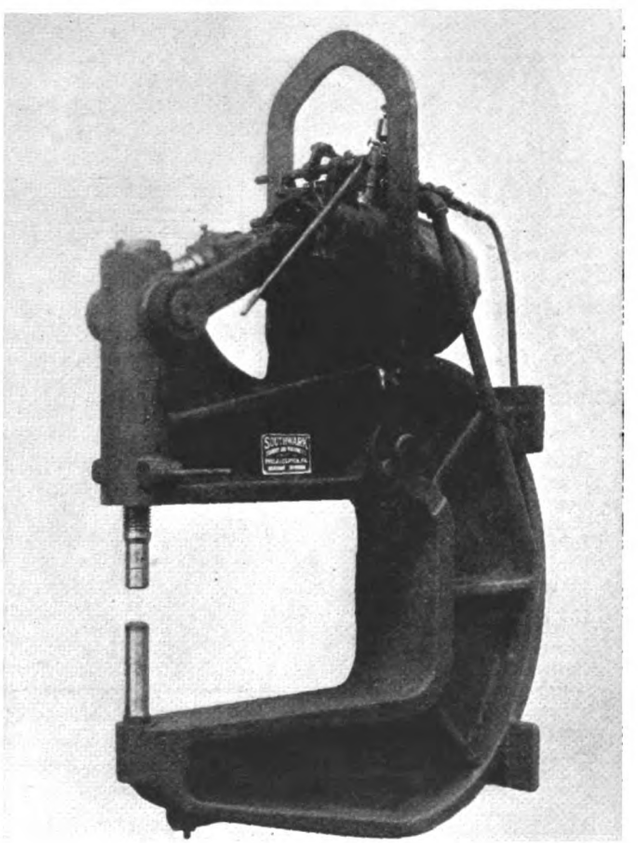
The old practice of laying felt on joiner decks underneath the canvas is not a good practice and involves unnecessary expense. Owners and shipbuilders are coming more and more to a realization of this. The argument in favor of the felt is that the tongue and groove construction of the decking causes the boards to stand up at the edges, thereby bringing about the rapid wear of the canvas along these joints when felt is not used and also making an uneven appearance. This difficulty can be overcome where necessary by going over the edges with a plane.

The objections to the felt are the cost and weight of the felt and the fact that when felt is used the canvas is more apt to be torn by boards or other heavy objects dropped on it. The felt is also said by some to rot the canvas.

Where the wood decking is given a thick coat of white lead and linseed oil paint and the canvas is laid while this is wet, and immediately given a heavy coat of linseed oil, and then two or three coats of white lead paint, according to the location, the results will be as good as, if not better than, with felt between the canvas and the wood.

## Driving Rivets With Toggle Type Pneumatic Riveters

FOR portable service pneumatic toggle type compression riveters have been found well adapted, while hydraulic riveters are generally used in stationary work where machines of deep reach are needed. The following explanation is given of the action of the toggle arrangements on pneumatic compression yoke riveters built by the Southwark



**Pneumatic Toggle Type Riveter**

Foundry and Machine Company, Philadelphia, Pa., which specially adapts them to portable service. Riveters are made by this company in sizes from 15 tons up to those developing 150 tons on the die and having a reach of 23 feet.

The toggle mechanism is designed to act rapidly until the die reaches the point of the rivet when it gradually decreases in speed and at the same time increases the pressure exerted on the rivet. The die travel is practically uniform towards the last of the operation and thus ensures driving tight rivets, drawing the plates together and following up the shrinkage of the rivet with full pressure until it is set. The die should be adjusted for any run of work.

All portable machines are provided with means for suspension and those above 36-inch reach with feet for mounting when used in stationary service.

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# The Most Interesting Job in the Yard

*In comparing one job with another in a shipyard there is always some feature of special interest not only to the man who holds the job but also to the other workers in the yard. In recent issues we have published the views of machinists, engineers and engine builders. This month a draftsman tells why he considers his job the most interesting one in the yard. How does your job compare with these? Tell us about it.*

NULLI SECUNDUS has chosen a doubtful nom-de-plume, at least I consider that the interest factor in his job is a long way second to that in mine. I am a draftsman. That statement in itself is almost enough without elaboration but the justification for my claim must be set down, so I propose to take one order I received from my chief to prove it.

I was working in a large naval establishment when the order came to "get out the torpedo arrangements." I had my complete order in those few words, but what a vista of interest it unveiled!

First I had to consider the general arrangement. There never had been a ship with eighteen torpedo tubes before. The tubes were new, the torpedo was new, the general idea was new and the whole job was fresh. I had to arrange the position of the tubes, how to get them into the ship, how to secure them and how to protect them from gunfire. Then to get the torpedoes on board from a wharf or from the water, to devise ways and means to transport them along the deck, strike them down to the 'tween deck space, to transport them there to stowage positions, to each and every tube, to workshops and assembly room and to turn them end for end in a limited space. Then came the arrangement of magazines to stow the war heads and dummies, to arrange workshops with benches and machines, to work out details of stowage brackets, transporting trolley, special hatchways, pulleys, derricks and winches and a host of accessories.

Just take one item as a sample of interesting work—the idea for protecting the tubes from gunfire. Large armored doors had to be arranged to hinge outboard and to be geared to work from inside. Each door weighed about 2½ tons and there were two at each set of tubes. The gearing had to be strong enough to open the doors against a list of several degrees and yet work easily so that one or two men could operate them. I saw that if a wave hit the forward door it might destroy the gearing so I had to devise a friction clutch between the hinge and the gear which would hold enough to open and close the door and stand a sufficient pressure to insure that the doors were reasonably watertight when they were shut but which would slip if a blow were applied before the worm of the gear would strip.

Here was interest indeed! I had to resuscitate my knowledge of worm gears and ball bearings, to polish up my calculus and the theory of the screw with friction and to sharpen my wits as well as my pencil. By the time the design was finished there was little of interest left to spare for Nulli Secundus. His work was reduced to reading the drawing. (You can see those doors and friction clutches in the lower left hand corner of Fig. 19, page 214, of your March, 1921, number, Mr. Editor.)

Then again there was the transporting job. To get a ton and three-quarters of torpedo down a hatchway, not more than three-fifths of the length of the torpedo long, into a 'tween deck space only seven feet six high required a nicety of placement of tackles hard to equal. Then to work out the tracks so that the long body could be moved from end to end of the ship and turned about and switched to each tube and stowage point was another phase. This involved considerable scheming and the design of a lifting block which would work in a headroom 6 inches less than had previously been designed for and that at an increase of lifting power.

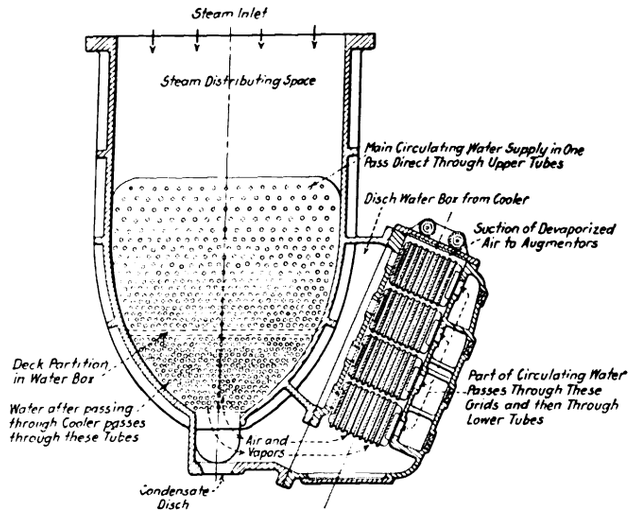
That one order led me to prepare 26 arrangement and detail drawings in the course of 12 months and I can say that there was not a melancholy moment in the whole time. Considering that a large vessel bristles, from keel to truck, with such tantalizing problems, can it be wondered that I claim for the draftsman the premier place as the holder of the most interesting job in the shipyard?

Pulman qui meruit ferat.

New Brighton, N. Y. I. C. G. COOPER.

## Waste Tubes Eliminated in New Surface Condenser

SURFACE condenser troubles are in general of two kinds —corrosion, causing tube leakage, and the accumulation of slime and scale fouling the tube walls, both due to unsuitable boiler feed water. To overcome these difficulties, the Ingersoll-Rand Company, New York, has developed an improved type of condenser in which waste tubes are elim-


Steam Inlet
Steam Distributing Space
Main Circulating Water Supply in One Pass Direct Through Upper Tubes
Disch Water Box from Cooler
Suction of Devaporized Air to Augmentors
Deck Partition in Water Box
Water after passing through Cooler passes through these Tubes
Part of Circulating Water Passes Through These Grids and then Through Lower Tubes
Air and Vapors
Condensate Disch

**Cross Section Through Main Condenser and Cooler**

inated, a uniformly high condensate temperature is maintained, counter-current air cooling provided and corrosion and fouling reduced to a minimum.

Waste tube elimination is secured by arranging the tubes in "stages," by correct shell shape and by the use of a separate devaporizer-cooler. The tubes spaced on wide centers in the top of the shell are brought closer together in each lower bank or stage. The shell itself is gradually narrowed from the widest point at the top to that of a nozzle running the length of the shell under the last row of tubes. This construction gives a sufficiently high steam velocity to sweep condensate and air films from the tubes, which action compensates for the decreased volume of the steam as it is condensed in its passage down over the tubes. The residual air and steam from the last row of tubes is drawn up into the cooler which is mounted on the side of the shell proper and fitted with cast iron cooling grids whose



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surfaces are adapted to devaporize and cool the air before it passes to the vacuum pump.

The devaporizing and cooling of the air is carried on independently in the cooler through which the flow is upward to the vacuum pump or steam jets. It is thus possible to cool the air without a corresponding lowering of the condensate temperature.

A single-pass arrangement in the I-R condenser makes possible high water velocities without excessive friction. The tubes are kept clear of slime and scale by this means which tends to reduce the temperature at the inner tube walls.

## LETTERS TO THE EDITOR

### Wear of the Teeth of Marine Turbine Reduction Gears

The wear of the teeth of marine turbine reduction gears is not being eradicated with material success, and it is unfortunate that such important parts of the propelling machinery of steamships should require exquisite workmanship and fitting and so much attention to oil and oiling. These features are especially out of place on such a coarse and flexible structure as a ship.

While no part of a marine turbine can stand inaccurate fitting and alinement such as are somewhat possible with reciprocating engines, designers are getting themselves more deeply into difficulty and there will be no outlet, if refinement is the attempted remedy. Any mechanism should have means of rendering slight inaccuracies harmless, but that principle cannot be applied to present designs of reduction gears.

The precision required in the case of double, and but slightly less with single reduction gears, should by some change become unnecessary. Considering the single turbine double reduction gear, the small pinion lies between two large gears and the teeth must fit them both exactly. That presents great difficulty, because the pinion and gears are each made in two parts with helical teeth inclined in opposite directions. These teeth must be located with the utmost nicety, and here more undesirable precision is required.

Still further, the two gear shafts each have a double pinion with oppositely inclined helical teeth, and the secondary gear must fit these two pinions. If one half pinion tries to accommodate itself to its gear, it tries to pull all other gears out of place. The whole assemblage is locked and there is no opportunity for accommodation to distortion or temperature changes.

Moreover, the longitudinal immovability of the system violates an important requirement for good distribution of lubricant and uniform wear. When Professor Sweet designed the Straight Line Engine he made the crank pin and shaft bearings longer than the boxes in order to permit free longitudinal movement of the shaft so that it could distribute the oil and wear uniformly. This is also done on direct current electric machines in order to wear commutators uniformly, and unless it is done with turbine gears there will never be any certainty of success, especially with double reduction gears. In the second reduction the halves of each pinion are some distance apart with a bearing between and, if the bearing heats and expands, the pressure on the teeth due to wedging action must be tremendous. This pressure not only occurs at this point but is transmitted to the primary pinion and the latter must encounter almost impossible service. These troubles have been somewhat reduced by having the secondary pinions on sleeves driven by interior shafts clutched to them at the aft ends. This is a step toward the accommodation for which I am pleading.

The requirements here pointed out, of course, can be met only by the use of teeth parallel to the axes of the shafts, and I venture to predict complete success with such gears on the first trial, especially if end play of shafts is allowed, and that they will ultimately be used. Pinions can be single and the necessity for intermediate pinion and gear bearings disappears, as well as sleeve shafts and clutches.

When De Laval turbines first appeared they had gears with helical teeth, and nobody has ventured to abandon them. Designers appear to assume that such gears are necessary, but as long as they are used there will be trouble.

Another cause of difficulty comes from using steel on steel. If anything is well established it is that steel on steel is a bad rubbing combination. Steel is selected on account of its strength, but cast iron would be much better, and, except the pinions, could probably be made of sufficient strength. Cast iron is the best of all rubbing materials because it has small cavities which hold oil. Steel rubbing on cast iron does well, and it would probably work well to have steel pinions working on flanged cast iron toothed rings bolted to the gear centers. Strong air furnace castings should be used.

Boston, Mass. F. W. DEAN.

### Should Direct or Alternating Current Be Used for the Lighting Set?

The almost universal use of direct current for lighting purposes on board ship is no more conclusive evidence of its superiority to alternating current than the fact that we now walk, whereas in a few decades we shall probably fly with equal ease, is an argument that walking is the better method.

Leaving out the main advantage of alternating current, the ease of transmission and distribution, because on a ship this is not paramount although very real on a large boat, and without enumerating the special advantages of alternating current apparatus and the simple alternating induction motor, it cannot be gainsaid that this same alternating current motor is the most widely used piece of apparatus in the world today. This would be no argument, if there were any other equal method put forth, but there is no direct current motor that has equaled its ruggedness, simplicity and general usefulness. It has no flash-over troubles, no commutator to take care of, and when voltage is applied it is bound to go; it can be reversed easily and definitely; speed changes can be made by using field combinations and the more improved types of induction motor will give all the speed regulation necessary for any service.

Witness the recent use of this motor in crane service, where the direct current motor was thought impregnable. Bells, signals, enunciators, lights, motors and accessories can be operated more efficiently from alternating current than from direct current, and such apparatus as requires storage batteries, such as telephones, telemotors and exciters for the alternating current regulators, can be supplied from a storage battery which is necessary on board a ship whether alternating current or direct current is the power supplied.

Alternating current wiring is just as simple as direct current wiring at the same voltage and the underwriters, or Lloyds, or the American Bureau of Shipping make no difference in the wiring requirements, except that direct current switching apparatus, because of the great danger of flash-over at heavy current and low voltage, has to be especially safeguarded whereas the flash-over from an alternating current circuit, which is non-inductive as is a lighting circuit, is practically nil. This latter feature of no flash-over is probably a safety feature of a thousand times more magnitude than the fact that direct current on the same voltage does not give as great a tingle or shock to the operator as alternating current.

Alternating current has been the ultimate winner in every field in which it has competed and I am very glad to see the subject raised in shipbuilding circles.

Newark, N. J. YOUNG AMERICAN.

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# Questions and Answers for Marine Engineers

## Inquiries of General Interest Regarding Marine Engineering and Shipbuilding Will Be Answered in This Department

**Conducted by James L. Bates**

*This department is maintained for the service of practical marine engineers, draftsmen and shipbuilders. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.*

### Size of Piston Ring—Arrangement of Buckets on Side Wheels—Lining Up a Beam Engine

Q. (1142).—(1) How much larger should a piston ring be than the steam cylinder to which it is to be cut and fitted? How much should be cut out of the eccentric turned rings, and give the thickness of the thinnest and thickest places? While I have in mind a steam cylinder of 6⅛ inches bore, I am anxious for a rule or formula that can be used for other rings.

(2) With a beam engine driving two side wheels, what effect will the loss of a few buckets have on the speed of the vessel, the steam pressure and throttle opening remaining the same as before? Should the same bucket area be put on all arms, or will there be anything gained in speed and fuel, if more buckets are added on the wheels, that they may be in the water when the maximum pressure is on the shaft? Explain how I may better balance my engine and save fuel, making same speed.

(3) How would you line up a beam engine?

A. (1142).—(1) The following quoted from "Mechanical Engineers' Pocket Book," Kent, edition 1916, pages 1023 and 1024, is believed to cover your question:

"Diameter of Piston Packing-rings.—These are generally turned, before they are cut, about ¼ inch diameter larger than the cylinder, for cylinders up to 20 inches diameter, and then enough is cut out of the rings to spring them to the diameter of the cylinder. For larger cylinders the rings are turned proportionately larger. Seaton recommends an excess of 1 percent of the diameter of the cylinder.

"A theoretical paper on Piston Packing Rings of Modern Steam Engines by O. C. Reymann will be found in the Journal of the Franklin Institute, August, 1897.

"Cross-section of the Rings.—The thickness is commonly made 1/30 of the diameter of cylinder + ⅛ inch, and the width = thickness + ⅛ inch. For an eccentric ring the mean thickness may be the same as for a ring of uniform thickness, and the minimum thickness = ⅔ the maximum.

"A circular issued by J. H. Dunbar, manufacturer of packing-rings, Youngstown, Ohio, says: 'Unless otherwise ordered, the thickness of rings will be made equal to 0.03 × their diameter. This thickness has been found to be satisfactory in practice. It admits of the ring being made about 3/16 inch to the foot larger than the cylinder, and has, when new, a tension of about two pounds per inch of circumference, which is ample to prevent leakage, if the surface of the ring and cylinder are smooth.'

"As regards the width of rings, authorities 'scatter' from very narrow to very wide, the latter being fully ten times the former. For instance, Unwin gives W = 0.014 d + 0.08. Whitham's formula is W = 0.15 d. In both formulæ W is the width of the ring in inches, and d the diameter of the cylinder in inches. Unwin's formula makes the width of a 20-inch ring W = 20 × 0.014 + 0.08 = 0.36 inch, while Whitham's is 20 × 0.15 = 3 inches for the same diameter of ring. There is much less difference in the practice of engine-builders in this respect, but there is still room for a standard width of ring. It is believed that for cylinders over 16 inches diameter ¾ inch is a popular and practical width, and ½ inch for cylinders of that size and under."

(2) It is assumed that the paddle wheels were suitably designed so as to deliver the required thrust at the designed number of revolutions, also that at the designed revolutions the engines were developing the designed full power.

If the loss of buckets were evenly distributed around the entire circumference of the wheel, the effect would be similar to that resulting from too small an immersion of the wheel or from fitting buckets of insufficient area. The thrust delivered by the wheel would tend to decrease, the revolutions to increase above the designed and the slip to become excessive. The speed of the vessel would fall off.

If, as seems more natural, several consecutive buckets were lost the thrust would tend to decrease and the speed of rotation increase over the designed when this portion of the wheel was in the water and during the remainder of the revolution the thrust would tend to increase and the speed to decrease approaching the designed figure. Such changes in thrust and speed of paddle wheel would result in serious variation in engine revolutions which would develop heavy periodic stresses in the reciprocating parts and engine frame. The speed of the vessel would fall off as in the previous case.

It is practice to make all buckets on a paddle wheel of one size and type. The fly wheel action of the heavy paddle wheel aids in reducing the peripheral variation in speed. However, unless multiple cylinders are installed, it is impossible to avoid wide variation in crank effort. When all buckets are of the same size, excess torque produces increased slip (the individual bucket being designed for average torque). Were bucket areas proportioned to torque, the thrust against the water would also be proportional to torque and the vessel would be subjected to a marked impulse every revolution of the wheel similar to that produced upon a row boat by the stroke of an oar. Such an arrangement would involve undue strains upon machinery and foundations, would be uncomfortable for passengers and would probably be wasteful of power due to the alternate acceleration and retardation of the ship.

Assuming proper design, as originally stated, the care and adjustment enjoined by good engineering practice is all that could be suggested on the basis of the information furnished. Material improvement in balance is probably a matter of considerable expense, if possible at all.

(3) The methods described in the writer's reply to Q. 1124, July, 1921, page 563, should be of assistance in lining up your engine.

### Density of Boiler Feed Water—Point of Cut-Off —Numbers on Engineers' Licenses

Q. (1143).—(1) If sea water is taken as containing 5 ounces solid matter per gallon, or 1/32 of its total weight, what is the working or usual upper limit allowed for working a Scotch boiler for density? For a Babcock & Wilcox boiler?

(2) When it is stated that the cut-off of a cylinder is 0.625, does this mean that the piston has traveled 0.625 of its total stroke when cut-off occurs, or does it mean that 0.625 of the stroke has yet to be completed?

(3) In the upper corner of an engineer's license there are numbers written in, such as 1-1 or 3-4. What do each of these numbers refer to?

A. (1143).—(1) For good operation of Scotch boilers when salt water is used for make up feed, the saline density should be maintained between 1/32 and 2/32, the 1/32 preferred if possible. Sea water contains magnesium chloride which, when heated, decomposes, liberating hydrochloric acid,



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which causes rapid corrosion of iron and steel. It has been found by experiment that, when the brine salinity is allowed to go above 4/32, large quantities of the acid are given off and cause corrosion in a very short time. In addition to the hydrochloric acid danger, there is in sea water a considerable amount of air and some carbonic acid gas. These also cause serious corrosion; this cannot be prevented, but is obviated to some extent by placing an air chamber at the main feed heater outlet, to serve as a collector and air and gas split off. Furthermore, when the boiler and fittings are made, some parts of iron or steel and others of composition, corrosion takes place from electrolysis (battery action, decomposing the steel or iron). Zinc protectors are usually placed within the boiler to counteract this trouble. With reference to watertube boilers, as a rule, when sea water is being unavoidably admitted to the boiler, blowing down should not be resorted to until the saturation exceeds 600 grains of chlorine per gallon in Babcock and Wilcox or fire tube boilers, 300 grains in Niclausse boilers, and 150 grains in small bent-tube or torpedo boat boilers. (Sea water contains more than one pound of salt for every 32 pounds of sea water, or about 1,850 grains of salt per gallon.)

(2) Cut off is that point in the stroke of a reciprocating engine at which the admission of steam to the cylinder is stopped. Its position in the stroke is expressed as a ratio between the distance already traveled by the piston when cut off takes place and the total travel or stroke of the piston.

(3) Prior to 1900 or 1901 marine engineers' licenses were issued annually. Since that time they have been issued for periods of five years. The first of the figures instanced refers to the number of licenses issued under the old system and the second to those issued under the new. Thus the figures 3-4 would indicate that the engineer had been licensed for a total period of 23 years.

## Apertures in Deadwood of Twin Screw Vessels

Q. (1145).—What is the latest practice regarding the fitting of apertures in the deadwood of twin screw vessels, and any alleged advantages or disadvantages of the same?

A. (1145).—Present practice in this country and in England does not favor fitting apertures in the deadwood of twin screw vessels. The tendency seems to be rather toward increased tip clearance (the shortest distance of propeller blade tip from surface of hull).

In a series of eighteen high speed vessels, all of similar type, the first of which was designed about 1908 and the last ten years later, the ratio of tip clearance to propeller diameter increased gradually from about 0.18 to 0.28.

In another series of ten medium speed vessels, the first designed in 1906 and the last in 1919, this ratio increased from 0.15 to 0.20 in the case of ships with large, slow turning wheels and from 0.20 to 0.26 or more for vessels with smaller and faster wheels.

While no apertures were fitted in any of the above cases the deadwood immediately forward of the rudder post was generally cut away below the level of the propeller shafting. This permitted the use of balanced rudders and gave decreased turning circle.

For slow full bodied vessels the same tendency toward increased tip clearance exists but the keel is usually carried aft without break to take the lower rudder pintle.

The following discussions relative both to apertures and to tip clearance are in general agreement with the foregoing and cover the principal advantages and disadvantages involved.

Holms in "Practical Shipbuilding," edition 1918, page 253, writes:

"In a few cases an aperture has been introduced so that propellers may overlap, and thus allow the shaft to be placed nearer the center line. The arrangement is advantageous in that the bossed portion of the vessel's side is less extensive, the length of the propeller brackets is reduced and the strength of all parts is increased; it is not now adopted, however, as it is found to cause excessive vibration."

Taylor in "Speed and Power of Ships," edition 1910, page 243, writes:

"It is undesirable to place screws so that their tips are too close to the surface of the hull. When a screw tip strikes the belt of eddying water adjacent to the hull, the virtual blows resulting are communicated to the ship, shaking rivets loose and causing vibration. The irregular forces upon the propellers also cause vibration of the ship.

"In some twin screw ships this trouble has been partially avoided by having an opening in the deadwood abreast the propellers. This saves the ship and with large propellers of moderate speed of revolution the tips can be brought quite close to one another without giving trouble. For small, quick turning propellers, such as those fitted with turbines, vibrations are very likely to be set up unless the blade tips are kept well clear of the hull, say 30 inches to 36 inches. It seems a pity to lose any of the beneficial action of the wake and it is possible that, if the hull abreast the propeller tip were made of circular shape, with the shaft as a center, specially strengthened to stand the pounding, and the propeller tips fitted close to the hull so that they caught the dead water through a large arc, the beneficial effect of the wake might be had without very objectionable vibration, though such propellers would probably be noisy. That is a matter, however, which could be determined only by a full sized trial. The only solution now known to be successful is to keep the blade tips well clear and accept the slightly reduced efficiency."

# NEW BOOKS

## Wharf Management—Stevedoring and Storage

**Reviewed by C. H. Peabody, Dr. Eng.**

WHARF MANAGEMENT—STEVEDORING AND STORAGE. By MacElwee and Taylor. Size, 6 inches by 9 inches. Pages, XX + 350. Illustrations, 301. New York: D. Appleton and Company.

This is the first book on the subjects discussed and the authors, who appreciate that the treatment is suggestive and not exhaustive, in it blaze the way for future study of the problems which are numerous and complicated.

Ships, shipping and all things concerning them are conservative; after the Phœnicians and their successors had spent a few thousands of years dealing with the sea they thought they knew something of its moods. The simplicity of the ancient methods of loading ships persists in places to the present day. Under some conditions such methods may be the most efficient, as when a river steamer noses into the levee and the roustabouts swarm ashore and file on board with sacks and bales on their backs. But when we realize that even a fairly active steamer may spend half her time in port and that it may cost as much to handle a package discharged from a ship as to carry it on a sea voyage we begin to understand the importance of this book. Stevedores seldom break out into literature and we can understand why it is necessary at this day to blaze the way. To be explicit, we may note that the expenses of a freighter in port may be $2,000 to $4,000 a day; ships must be loaded and unloaded, and this cannot be unduly hurried; but in a sense a ship is earning money only when at sea.

This work does not deal with the design and layout of wharfs, but at the beginning some ideas are necessary in order to understand the discussion of their management. In America we are accustomed to long narrow wharfs which

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sufficed for the days of sailing ships but which now lead to all kinds of congestion and inconvenience. Perhaps the worst condition is found in New York City, which by some fatality has the blocks turned crosswise; the north and south avenues having short blocks and the east and west streets, long blocks. Following this condition and the riparian city rights the wharfs conform to the streets on both North and East rivers, and both wharfs and slips are very inconveniently narrow. Contrast this with the European quays with the ship lying broadside on and discharging from all the hatches to land directly, though the quays also have their own problem in handling cargoes.

Lighterage is found in greatest development in New York City and in some South American ports; for the latter the great difficulty of building wharfs and the comparatively light commerce control conditions; for New York the natural lay of the land on a long narrow island is the dominant feature. There is one advantage in lightering, namely, that freight from any railroad may be delivered to any wharf; when the freight is lightered in railroad cars the conditions are not so bad. The lack, or the impossibility, of a belt line road calls for an excessive amount of trucking; and the trucking may cost a tenth of the worth of certain packages. The antithesis of this condition is found on our Great Lakes in the handling of iron ore, which runs into the ships' holds in streams and is dug out by giant clam-shell buckets.

The administration of the work on the wharf is under the superintendent, with his clerical force and checkers, who must keep proper account of each and every item of freight, and the stevedore with his longshoremen who handle the freight; a good stevedore may be worth too much as such to be promoted to be superintendent, for he is the man who sees that the freight goes in and that it does not shift. Longshoremen are too often recruited from drifting unskilled labor, whereas it takes skill for a man to throw a sack of flour into proper stowage or to induce a barrel to settle in its proper place.

There are two ways of transferring freight to the hold of a ship, (a) through side ports and (b) down hatches. The first is proper for coastwise, Great Lake and river steamers, especially with package freight; the second is almost universal for deep sea ships. The greater part of loading through side ports is by hand trucks, and that goes well enough so long as there is little or no tide so that freight moves horizontally; on the seaboard where there is large rise and fall of tide the labor becomes slow and excessive. A makeshift arrangement is to run by power an endless chain onto which the truckman may hitch and get help uphill. A more completely mechanical method is to have a traveling belt or chain with cross-cleats or pockets into which packages are thrown or placed and which empties them out at the end of the run.

Seagoing ships are habitually loaded through hatches; formerly the hoisting was done by hand power, then a horse was used and lately steam power or electric power. The American system puts the hoisting onto the ships which have masts and cargo booms, usually two booms to a hatch; in consequence wharfs are poorly supplied with hoisting appliances unless in the form of cranes or derricks for specially heavy pieces. Modern winches are rapid and handy, so that one man may work two booms with right and left hand levers. Electric winches are adaptable to motorships; they must be rugged and watertight; they have the advantage of not wasting energy when idle.

A simple but very important matter is the method of hand signaling; this must be simple and positive and should be completely standardized.

A load for a winch is called a draft; it may be a single piece or a bunch; the weight of a draft may be 1,000 or 2,000 pounds. A common method is to wrap a rope sling around a piece or a bunch, slip one loop through the other and catch onto the hook hanging from the boom; or articles may be packed on a platform and all hoisted together.

For heavy pieces of freight a locomotive crane is convenient, running on rails to the place where it is needed. When the volume of such freight is sufficient a gantry crane may run along the face of the wharf. Very heavy pieces like locomotives are conveniently loaded by tower cranes. If cranes are used intermittently the overhead becomes excessive.

The stevedore must have wide experience and a high degree of intelligence to trim the cargo so that the ship shall float erect on an even keel; and further, he must control the center of gravity so that the ship shall be neither stiff nor cranky. A ship properly stowed should have the hold full and be down to her lines; usually a mixed cargo is required for this end; ships like ore carriers or colliers are designed to properly control the stability. Frequently ships that are properly stowed when at sea may become cranky in harbor during unloading and numerous accidents have happened in such cases.

There are indeed rules for insuring safety of the ship and its cargo; unfortunately they emanate from various sources, government laws, city and state regulations and the rules of classification societies. These rules are liable to be insufficient, inconsistent or contradictory. In too many cases regulations may be evaded if accidents are avoided. It would appear that some system of inspection should be possible to forestall evasion.

The importance of loading and unloading rapidly has been emphasized; when a good system is used effectively a ship can discharge cargo faster than it can be cleared from the wharf or quay; again it is necessary to accumulate freight for a ship and to have it properly sorted. A warehouse is essential for both purposes and should be worked in conjunction with the delivery of freight by trucks, railroad or lighters either to or from the ship. The smooth working of such a complicated system without hitch or interference calls for a correct plan, proper equipment and high administrative ability. Hand trucking to or from a warehouse becomes expensive and ineffective; it should be replaced or supplemented by electric traction of some type. A very flexible traction is by an electric truck with several trailers. The trailers may be loaded individually, made into trains and delivered where required. Such a train may run anywhere on the warehouse floor or wharf. A monorail track may be installed overhead out of the way and work quickly and effectively; it requires more head room and is not so flexible. Electric elevators for warehouses are worked by push buttons which deliver the cage very near the proper floor; an automatic electric device quickly adjusts the cage accurately to the floor.

The floors of a warehouse have good head room and goods must be properly tiered to use the room and avoid danger to containers and contents. This, together with the necessity for assorting the goods for convenience and accessibility, calls for intelligent planning and efficient superintendence. So simple a matter as turning each package so that its tag can be seen has its importance.

When we consider the variety, importance and complexity of the subjects treated in this book we appreciate the work of the authors in blazing the way.

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AN INVESTIGATION OF THE FATIGUE OF METALS is described in a 185-page pamphlet by H. F. Moore, research professor of engineering materials, and J. B. Kommers, research associate professor of engineering materials, published by the University of Illinois, Urbana, Ill., giving complete results of an investigation of this subject covered by the Engineering Experimental Station, University of Illinois, in cooperation with the National Research Council of the Engineering Foundation and the General Electric Company.

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## PERSONAL MENTION

JASPER MOON has been appointed manager of the Booth Steamship Company, Ltd.

W. L. JOHNSTONE has been made assistant general passenger agent of the Pacific Mail Steamship Company, San Francisco, Cal.

A. T. NOTT has been appointed superintendent of terminals for the Los Angeles Steamship Company. Mr. Nott was formerly dock agent for the company.

P. H. LACY recently succeeded C. H. Marshall as district director of the United States Shipping Board at Savannah, Ga. Mr. Lacy was formerly district director at Boston.

P. K. CROCKER, superintendent of European trades of the Shipping Board's traffic department in New York, has been appointed assistant to George H. Wells, traffic manager.

H. C. CANTELOW, formerly with the Pacific Steamship Company, has been appointed Pacific Coast manager of the Luckenbach Steamship Company, Inc., with headquarters in San Francisco.

HUGH GALLAGHER, formerly general eastern representative of the Pacific Steamship Company, has become passenger manager of this company in California, with headquarters at San Francisco.

CAPTAIN R. C. BRENNAN recently assumed his duties as port captain for the Admiral Line at Seattle, Wash. He has just spent two years in the Orient as supervising port captain for the company.

WILLIAM ALTMANSBERGER has been made superintendent of hulls and machinery of Geyelin and Company, Inc., at the Philadelphia office. Mr. Altmansberger has been connected with the Earn line and with the United States Salvage Association.

E. S. LEAVITT has been appointed general agent of the Southern Pacific Railroad and the Morgan Line in Boston to succeed J. H. Glynn, deceased. Mr. Leavitt was manager of the traffic department of the Shipping Board in Boston for a period of four years and prior to this time was connected with the Southern Pacific.

GEORGE M. SKINNER has been appointed manager of maintenance and repairs for the United States Shipping Board in San Francisco, Cal. At the present time Mr. Skinner is conducting a survey of the Pacific Mail liner *Empire State* in connection with the application made by the company to increase the present steerage capacity from 300 to 600 accommodations.

NORMAN F. BROWN, formerly director of public works of Pittsburgh, Pa., has been elected vice-president and director of the Dravo Contracting Company, Pittsburgh, Pa. Prior to his connection with the city of Pittsburgh, Mr. Brown was assistant to the chief engineer of the Pennsylvania Railroad. During the war he was commissioned a major in the transportation corps of the American Expeditionary Forces.

ROGER D. LAPHAM has been made a member of the firm of McCormick and McPherson of San Francisco, Cal. This company, which hereafter will be known as McCormick, McPherson and Lapham, has been appointed Pacific Coast agent for the Texas Oil Company. Mr. Lapham was for many years connected with the American-Hawaiian Steamship Company, first as agent in Seattle, then in Los Angeles and later as assistant traffic manager in San Francisco.

CAPTAIN SIR BERTRAM HAYES, of the White Star Liner *Olympic*, was recently given the title of commodore of the White Star fleet. In May, Captain Hayes will assume command of the new liner *Majestic* on her maiden trip in the New York-Southampton service of the White Star Line.

RICHARD H. FARLEY has been made passenger traffic manager of the International Mercantile Marine Company, New York. At the same time Thomas R. Thorne and D. D. Weipert were appointed assistant passenger traffic managers in charge of the first and second class departments and David Lindsay as assistant in charge of the third class department. Mr. Farley succeeds W. W. Jefferies, passenger traffic manager since 1906 and a member of the organization since 1882.

WILLIAM M. KENNEDY, who, as announced in the March, 1921, issue of MARINE ENGINEERING AND SHIPPING AGE, resigned as general works superintendent of the Chester (Pa.) yard of the Merchant Shipbuilding Corporation to accept a position with the repair department of the United States Shipping Board, has been appointed supervising local manager, North Atlantic district, of the Shipping Board vice J. J. Eason, resigned. Mr. Kennedy has had twenty years' experience in various branches of the shipbuilding industry, having served in various capacities with some of the largest private shipyards as well as in the Navy yards.

## OBITUARY

JOHN A. DONALD, one of the original members of the United States Shipping Board, died at Rye, N. Y., on the morning of December 13, 1921, from an attack of pneumonia. He was selected as a member of the Board by President Wilson and took office in the spring of 1917, just at the time of our entry into the Great War. He was the only member of this Board who had had any shipping experience. Although born in Scotland, he came to this country in 1888 and took out his citizenship papers as soon as practicable. He spent his entire life in the shipping business and at the time of his appointment had organized and become president of the Donald Steamship Company. Although taking up public office at a time in life when he could have retired and spent the remainder of his life in ease, he devoted his untiring energy to the needs of the country in shipping which became of such vital importance during the war. His many years of experience proved of inestimable value to the Government in the performance of the responsible duties which were thrust upon him. Throughout the entire war and until the end of his term he devoted his time, energy and health to his country's demand. Many men, much younger than he, broke down under the terrific strain of public duties in those days, when the best each man had in him was required in the interests of the nation. Mr. Donald left office with his health shattered but with the consciousness of having performed his part in the great conflict to the uttermost of his ability. It was frequently a cause of wonderment of his confreres how he could bear up under the burdens which were placed upon him. His death at a time when he should have been enjoying a well-earned rest marks Mr. Donald as one of the sacrifices of the Great War as truly as though he had fallen on fields of Flanders. Mr. Donald was well and favorably known to the shipping public throughout the land. His patriotism and courage were inspiring to those associated with him. His genial disposition and his unfailing willingness to help all who applied to him for assistance will be greatly missed by his hosts of friends. His mortal remains were interred with appropriate ceremonies in the old Moravian cemetery, on the side of Staten Island hills, overlooking the sea, which he loved so well.

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# Shipping and Ship Operation News

**Changes in Steamship Routes — Passenger and Freight Activities—Port Plans and Other Notes of General Interest**

## Steamships Brabantia and Limburgia Bought by American Ship and Commerce Corporation from Holland Lloyd Line

### Biggest American Shipping Transaction Consummated—Steamers Are of 20,000 Gross Tons Each—Will Be Operated by United American Lines Between New York and Hamburg

ONE of the biggest transactions in the history of American shipping is seen in the announcement that the American Ship & Commerce Corporation, of which W. A. Harriman is chairman, has purchased the well-known passenger steamers *Brabantia* and *Limburgia*, of 20,000 gross tons each from the Royal Holland Lloyd Line. It is planned that these vessels will be transferred to the American flag at once, and that they will be placed in operation in the North Atlantic.

The *Brabantia* and *Limburgia* were built in Germany originally to the order of the Hamburg-American Line. They were in the course of construction when the war broke out. Work on them was suspended for a time, and they were not completed until 1920. Before the ships were finished they were sold to the Royal Holland Lloyd, under whose flag they first went into service.

The steamers are similar as regards general design and equipment, though differing in certain measurement details. The *Brabantia* is 596 feet long, has a breadth of 72.3 feet, and a depth of 40.2 feet; the *Limburgia* is 592 feet long, having a breadth of 72.3 feet and a depth of 39.7; both are oil burning, triple screw steamers of 17.5 knots speed. They have passenger accommodations for about 400 first class, 260 second class and 900 third class.

They will be operated between New York and Hamburg, with calls at French and English Channel ports. They will fly the house flag of the United American Lines, which is the operating organization for the American Ship and Commerce Corporation.

## STEAMSHIP INTERESTS

At a recent conference with President Harding, attended by Secretary Hoover, and Mr. Lasker, over shipping rates for the Congressional Relief of Russia, the following arrangement was reached:

The Shipping Board would undertake to transport at cost, but American private shippers should be given priority in employment over the Shipping Board steamers so long as they were willing to quote fair rates.

It was considered that $1.50 per ton or so above going rates for foreign shipping represented approximately the difference in costs imposed upon American shipping by American shipping law and American wages and that approximately this figure should be used as a criterion in determining fair rates for private American shipping. The cooperation of the majority of American shipowners has been assured.

The United States Shipping Board has announced the allocation of sixteen vessels ranging in size from 4,145 tons to 10,914 tons, to various ocean and coastwise steamship line.

Three electric drive ships are now on the high seas on long voyages and latest wireless reports indicate that all are making satisfactory progress. The vessels are the *Archer* and the *Eclipse*, operated by the Barber Line, and the *Victorious*, which was recently allocated to the Black Diamond Line.

The Eastern Steamship Lines, Inc., have established a daily freight service between Boston and New York, which will be maintained by the steamers *H. F. Dimock, Herman Winter, Norwalk*, and *Delaware*. This is the first time that a daily strictly freight service has ever been attempted between Boston and New York, and it will be maintained all through the winter, according to present plans.

## MOTOR BOAT SHOW

### 17th Annual Exposition at Grand Central Palace February 17-25

With the most successful automobile show ever held in New York City ended, interest in engines and motors turns to the 17th annual exposition of motor boats to be held in Grand Central Palace, February 17 to 25. This show holds the same important position in the motor boat world as the automobile display does in the motor car industry. Both are affiliated in many ways, and there are hundreds of persons who own and drive their own automobile, who also own and operate their motor boat.

The National Association of Engine and Boat Manufacturers, Inc., did not schedule a show last year because at the time such a display could have been held, Grand Central Palace, where the organization wanted to stage its exposition, was not available. As a result the interest in what the boat and engine builders will have to show this year is greater than ever. There will undoubtedly be new ideas in body building in the large cruisers. Speed craft will also attract because in this class of boats, engines of large horsepower figure just as much as body design. Runabouts which are the most popular craft in the nearby waters, of Sheepshead, Jamaica and Gravesend Bays will be displayed in large numbers.

During the past few years model yacht racing has become a most popular sport and the engine and boat manufacturers have recognized this. In fact, the international races between these miniature craft have become so important that the Central Park Model Y. C. is building fifteen class "B" boats for the elimination races to pick a defender against the boats W. J. Daniels, of England, will send here next summer. The Prospect Park Model Y. C. will have entries in these elimination contests, while the Montclair Model Y. C., the Irvington Model Y. C. and the Tacoma Model Y. C. have also entered the lists. The races will be held in June.

## Old Dominion Transportation Co. May Purchase Vessel for Addition to Passenger Service Opening in Spring

### Steamers "Hamilton" and "Jefferson" to Be Refitted for Resumption of Run Between Norfolk and New York—Line Suspended Since 1917 Responds to New Demand

BOAT passenger service between Norfolk and New York, suspended since 1917, is to be resumed this spring, the Norfolk Chamber of Commerce announced, and the steamers *Hamilton* and *Jefferson* are to be refitted as passenger steamers to be ready for the opening of the season.

Purchase of a third vessel by the Old Dominion Transportation Company is probable.

The *Hamilton* and *Jefferson* were passenger vessels until 1917 when they were taken over by the government, stripped of staterooms and converted into freight ships. When the Old Dominion Transportation Company was formed last year the ships were put on as freight carriers. It is stated that increased demand for additional passenger service has prompted the change.



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# Optimism for 1922 Expressed at Annual Conventions of Marine Engineers and Supplymen at Washington, D. C.

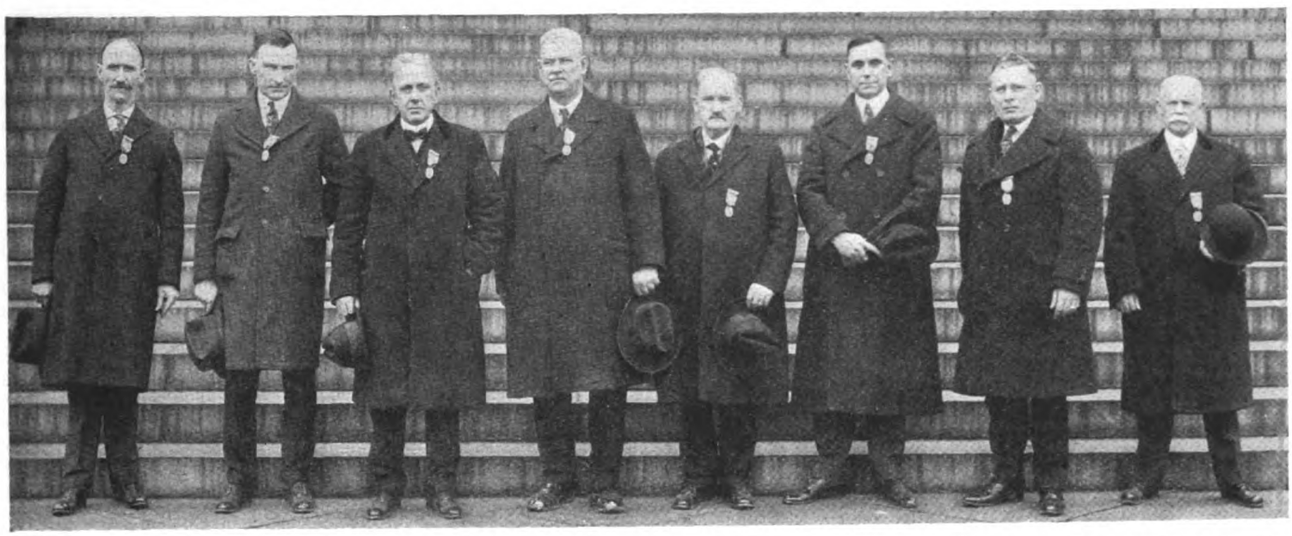
## Outlook for Year Considered More Favorable—Delegates Hear Addresses and Call on President Harding—Smoker and Theatre Parties Entertain the Visitors

The forty-seventh annual convention of the National Marine Engineers Beneficial Association was held at the Hotel New Ebbitt, Washington, D. C., January 16-21, ing 1921, there was considerable optimism expressed over the prospects for substantial improvement in 1922. Following are the association's officers for 1922: William S. Brown, president; William H. Hyman, vice-president; Samuel J. Hogan, conductor; J. E. Purdee, Chaplain; D. P. McCracken, door keeper; C. M. Sheplar, executive committee; William J. Barrett, executive committee.

President Brown called the convention to order at 9:30 A. M. on Monday, January 16, at the Ebbitt House and after the formal procedure of credentials and similar matters, Mr. Brown introduced Secretary of Labor Davis who was followed by General Wehler. There were about 350 officers, delegates, representatives and their wives in attendance.

On Wednesday the entire convention was escorted in a body to the White House where they were received by President Harding and on Wednesday night the France Packing Company entertained the ladies with an elaborate "Ladies Evening." The social event of the convention, a smoker, was tendered the delegates on Thursday night, January 19, by the Marine Engineers Supplymen's Association at the Willard Hotel, the ladies spending the evening at theatre parties.

Washington was selected as the convention city for 1923. As the present officers' terms have not yet expired, there was no election. The Supplymen's Association, by unanimous vote, elected MARINE ENGINEERING AND SHIPPING AGE to membership.



**Officers of National Association: Left to right, D. P. McCracken, Doorkeeper; Samuel J. Hogan, Conductor; William H. Hyman, 2nd Vice-President; William S. Brown, President; George A. Grubb, Secretary-Treasurer; C. M. Sheplar, Executive Committee; William J. Garrett, Executive Committee; J. E. Purdee, Chaplain**

**Officers and Delegates of Engineers and Supply Men's Conventions on U. S. Treasury Steps, Washington, D. C.**

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# Shipbuilding and Terminal Development

**What the Shipyards Are Doing—Dry Dock Notes—Launchings—New Engineering Projects**

## $3,704,000 Asked for Marine Work by Department of Plant & Structures of New York in 1922 Requirements

### $1,100,000 Asked for Construction of New East River Ferryboats and $550,000 for the Purchase and Reconditioning of Others—Balance Is for Ferry Terminals, Equipment, Etc.

A TOTAL of $3,704,000 for various marine work in connection with the building of new boats, ferry terminals and equipment incidental thereto is asked by Commissioner Grover A. Whalen, of the Department of Plant and Structures of the City of New York, in his recommendations for funds for 1922 to the Board of Estimate and Apportionment.

Included in the recommendations is a request for $1,100,000 for the construction of new ferryboats for the East River, which will probably be propelled by steam of Diesel engines, $550,000 for the purchase and reconstruction of existing ferryboats and $325,000 for constructing a new floating drydock. The funds requested for marine work during the year include the following:

| | |
|---|---|
| Construction of new ferryboats for East River | $1,100,000 |
| Purchase and Reconstruction of existing ferryboats | 550,000 |
| Completion of ferry terminals, Whitehall Street | 400,000 |
| Construction of floating dry dock, Atlantic Avenue | 325,000 |
| Vehicular approach connecting marginal way, St. George terminal | 225,000 |
| Reconstruction of shop to handle shafts and other heavy work, Atlantic Avenue | 200,000 |
| Plaza in front of Whitehall Terminal | 200,000 |
| Construction of ferry slips at Whitehall Street | 116,000 |
| Three electric bridges, Whitehall ferry slips | 100,000 |
| Reconstruction, Atlantic Avenue ferry terminal | 76,000 |
| Reconstruction, Hamilton Avenue ferry terminal | 76,000 |
| Reconstruction, Fulton Street, Brooklyn, terminal | 66,000 |
| Reconstruction, Fulton Street, Manhattan, terminal | 60,000 |
| Reconstruction of street level, etc., South Street terminal | 50,000 |
| Widening Viaduct, Richmond Terrace, S. I., to upper level of terminal | 40,000 |
| Additional coal bunkers at St. George, S. I. | 30,000 |
| Reconstruction, North rack and coal pier sheds at Astoria | 30,000 |
| Removing old ferryhouse, Whitehall Street | 20,000 |
| Construction of derricks in connection with dry dock | 20,000 |
| Construction of fire house and moorings at St. George for fireboat | 11,000 |
| Construction of foot bridge from Whitehall terminal to Battery Park | 16,000 |

## Six Dump Scows to Be Built By Street Cleaning Department During Year

It is reported that the Department of Street cleaning, of the City of New York, will place during 1922 contracts for six wooden side-dumping scows, which it is believed will cost close to $50,000 each. It is understood that the department is in need of these boats and that definite action will be taken toward the issuing of plans and specifications as soon as the question of patent rights is definitely settled.

## "Mongolia" Awarded to Tietjen & Lang Yard of Todd Shipyard Corporation

The contract for reconditioning the steamship *Mongolia*, of the International Mercantile Marine Company, has been awarded to the Tietjen & Lang plant of the Todd Shipyards Corporation. The work to be done on the ship has to do chiefly with the construction and complete equipment of new third class accommodations besides the various other work incidental thereto and is practically the same as that now being done on the steamer *Manchuria* of the same company, which contract was also awarded to the Tietjen & Lang yard last week.

It is believed that the total amount involved for reconditioning both ships will probably be in excess of half a million dollars.

## Todd Shipyards Corporation Buys Land of Mobile Shipbuilding Company

William H. Todd, of the Todd Shipyards Corporation, having shipbuilding and ship repair plants on both the Atlantic and Pacific coasts, has purchased the land on which the plant of the Mobile Shipbuilding Company was located during the World War and two years afterward. The purchase price is said to be $130,000. An offer of $165,000 for the material on the yards of the plant which was under the control of the United States Shipping Board, has been made by Fitzpatrick & Till, and is now under consideration.

## Japanese Tanker Is to Have Peabody Burners

The Peabody Engineering Corporation, 331 Madison Avenue, New York City, has been awarded the contract for the Peabody-Fisher wide range fuel oil mechanical burners for the tank ship, now in course of construction at the yards of the New York Shipbuilding Corporation, Camden, N. J.

## $8,200,000 Is Total Amount Required For Complete Reconditioning of Leviathan; Newport News Company Low Bidder

### President Powell, of the Emergency Fleet Corporation, Gives House Subcommittee Approximate Final Figures on Cost of Putting Ship in Service

The steamship *Leviathan* can be completely overhauled and put in condition for trans-Atlantic service for a total cost of $8,200,000 according to a statement of President Joseph W. Powell, of the Emergency Fleet Corporation, at a recent hearing before the Subcommittee of the House Committee on Appropriations at Washington, D. C.

"In estimating the cost of reconditioning the *Leviathan*," Mr. Powell said, "the following figures have been used: The Newport News Shipbuilding & Dry Dock Company bid for reconditioning and conversion of the vessel to burn fuel oil, $5,595,000. The Newport News Shipbuilding & Dry Dock Company bid for repairs and machinery of the *Leviathan*, $515,000. The bid of Gimbel Bros., for equipment of steward's department of the *Leviathan* was $539,000; allowance for library, not included, $15,000; cost of moving the ship to the contractor's yard, insurance covering moving vessel to the contractor's yard, dry docking for 30 days, new anchors and chains, moving of ship to dry dock, and cost of the trial trip, $627,000; maintenance of steamer and guarding ship for 14 months' period during reconditioning—you understand we have to have this big force on board taking care of her all the time that work is being done—$680,000; inspection during reconditioning, $225,000, making a total of $8,166,000.

"So far as it is humanly possible to foresee the work that is to be done its cost is covered by the above estimate, and I believe we are giving you a figure that is thoroughly justified."



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# Many New Vessels Are Proposed For Addition to Various Government Departments During Ensuing Year

## Two Diesel Electric Coast Guard Cutters, Diesel Electric Seagoing Dredge and Several Lighthouse Service Vessels Are Pending—Request for $730,000 for Lighthouse Vessels Awaiting Final Decision

ACTIVITY in the construction, during 1922, of various vessels for Government service is indicated in latest reports received by MARINE ENGINEERING AND SHIPPING AGE. In this connection it is stated that the United States Coast Guard is making plans and has asked for an appropriation for the construction of two coast guard cutters, one of 1,200 horsepower and one of 2,400 horsepower. The boats are to be propelled by Diesel electric engines, one to be equipped with four sets of 600 horsepower each, and one to be equipped with two sets of 600 horsepower each.

The War Department, it is understood, is preparing plans and specifications for a seagoing dredge 246 feet long, to be equipped with Diesel electric drive of six units of 500 horsepower each, or a total of 3,000 horsepower.

### LIGHTHOUSE VESSELS

According to the Commissioner of Lighthouses of the Department of Commerce, careful estimates and examinations as to the condition and further serviceability of vessels of the Lighthouse Service, it is found that sixteen light vessels and eleven tenders should be replaced within the next five years. Fifteen of these vessels are urgently needed.

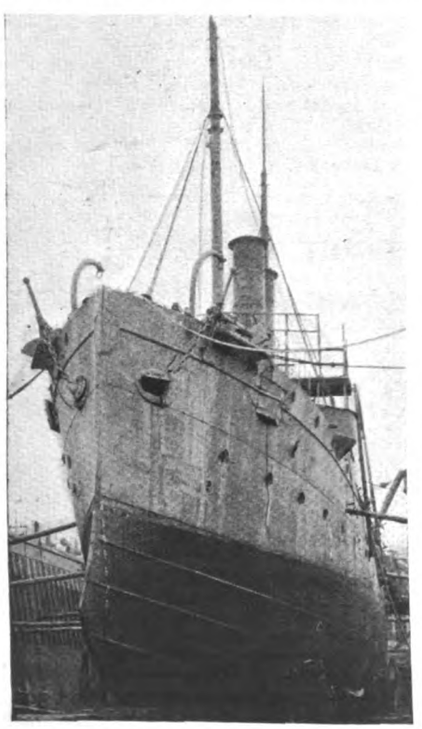
### NEED OF NEW SHIPS

Several of the older lighthouse tenders, the Commissioner reported, have reached the point where because of age and deterioration their usefulness and seaworthiness are impaired and they are greatly in need of replacement, being beyond economical repair. It is considered necessary to construct at least two tenders each year to maintain the fleet in an efficient condition.

For the construction of new lighthouse vessels, a request for $730,000 is now pending before Congress. This amount is a reduction from $1,500,000 originally requested for two tenders and four light vessels. The Commissioner states that the Lighthouse Service maintains light vessels at forty-nine stations.

# Former Spanish Warship Isla De Luzon, Captured at Manila Bay, Is Reconditioning for Salvage Service

The former warship *Isla de Luzon* is in drydock at the plant of the New York Harbor Dry Dock Corporation, Rosebank, Staten Island, N. Y., undergoing repairs and general overhauling in preparation for service as a salvage vessel. In addition to general alterations in accommodations and removal of gunboat equipment, she is being fitted with a new mast and derrick gear for handling heavy loads, and is also having heavy towing equipment installed.



**Isla De Luzon's Bow Ram**

This interesting vessel was built at the yard of Messrs. Swan, Hunter, and Wigham Richardson, at Newcastle-on-Tyne, England, in the year 1887, for the Spanish Government. She saw service in the Spanish American war where she was captured by Admiral Dewey at the battle of Manila Bay. She was later sold out of the United States Navy, and is still good for many years of useful work. She is in remarkable condition for a vessel of her age, and belongs to Sloan Danenhower & Company, of New York City, who are supervising her fitting out as a salvage vessel. The vessel is twin screw, propelled by two triple expansion engines working horizontally. Steam is supplied by four Scotch boilers. She is 192 feet long by 30 feet beam.

**Stern View**

## London Steam Turbine Company Takes Over Steam Motors Company

The officers of the Steam Motors Company, having the belief that the Steam Motor is the best machine of its class in the market and realizing that it would be necessary to increase its capital in order that the Steam Motor should take its proper place in the industrial world, have on January 1, 1922, sold to the London Steam Turbine Company of Troy, N. Y., all of its assets, patents and interests, and from this date the Steam Motors Company will be known as the London Steam Turbine Company, of Troy, N. Y.

Mr. London, who was the president of the Steam Motors Company, and a turbine engineer of international reputation, will occupy the same position in this company.

Mr. DeLeon, the vice-president and general manager, brings to the company an experience of twenty-five years as a manufacturing executive with some of the largest concerns in the country.

## Construction of Eight New Ships Is in Prospect for the Near Future

It is reported that the Eastern Steamship Company, of Boston, in conjunction with the Clyde Line, of New York, is contemplating the construction of two passenger ships, which it is expected will cost close to $2,000,000 apiece. Although complete details with regard to these ships are lacking at present, it is understood they will be about 420 feet in length and oil burning.

### TO BUILD SIX MOTORSHIPS

The firm of Whittlesey & Whittlesey, naval architects, 17 Battery place, New York City, has issued plans and specifications for the construction of six combination cargo and passenger Diesel motorships. The ships are to be 225 feet in length; the engines of about 1,500 horsepower, driving the vessels at a speed of about 13 knots. The new ships are for the Tri-National Steamship Company, 17 Battery place, New York.

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# Marine Construction News of the Month

## Ship Contracts — New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

## SHIPS AND SHIPBUILDING

**New Feed Pumps, San Francisco, Cal.**—It is reported that two new feed pumps will be installed in the Shipping Board steamer Golden State.

**Speed Boat Contract, Neponset, Mass.**—A contract for a 60-foot speed express runabout, designed by Henry J. Gielow, Inc., naval architects and marine engineers, 25 West 43rd Street, New York City, has been awarded to the George Lawley & Son Corporation. The boat is to be equipped with two 150-horsepower speedway motors to develop a speed of 27 knots.

**Overhauling Job, Jacksonville, Fla.**—The steamship Cuba, of the Peninsula & Occidental Steamship Company, plying in the Key West to Havana route, has been placed in dry dock at the plant of the Merrill-Stevens Dry Dock & Repair Company, to be scraped, painted and overhauled. The ship was put in service last February and this is the first time she will be in dry dock since being turned over by her builders.

**General Overhaul, San Francisco, Cal.**—The steamer Hanawa, a vessel of 12,000 tons, built for the United States Shipping Board and which has not yet been in commission, has been towed from her anchorage where she lay idle since her completion last June, to the Bethlehem shipyards at San Francisco, prior to being chartered by the Shipping Board to the Columbia Pacific Shipping Company, of Portland, Ore.

**Shipbuilding Boom, Essex, Mass.**—According to reliable information at least a dozen vessels to be added to the Gloucester fishing fleet will be ordered during the coming year. One of these craft is already on the stocks, work on the molds of another is going on, two others are a certainty and approximately eight more are planned. At the yard of J. F. James & Son the construction of the schooner Puritan is now well under way, and at the Arthur D. Story shipyard the preliminary work is being completed on the new craft for Captain Clayton Morrisey, patterned after the old Oriole. Plans are also being prepared for the construction of a new vessel for Captain Morton Selig, and Captain Ernest Parsons is to have a vessel built at Essex this winter.

**Steel Piping Contract, Chester, Pa.**—It is announced by J. L. Ackerson, vice-president, that the Merchant Shipbuilding Corporation has been awarded a contract by the Frederick Snare Corporation of New York for the furnishing of approximately six and a half miles of riveted steel piping, weighing about 10,000 tons, part of the extension line of the Catskill Aqueduct. The section contracted for extends from the neighborhood of Cold Springs to Ossining, New York. The contract amounts to more than half a million dollars.

**Vessels to Be Overhauled, Jacksonville, Fla.**—The steamship City of Miami, owned by the Havana-American Steamship Company, has been placed on the dry dock of the Merrill-Stevens Company to be scraped and painted and made ready for the winter Miami-Havana run. The big ferry steamer Joseph R. Parrott, which is operated by the East Coast Car Company between Key West and Havana, is also at the yard of Merrill-Stevens awaiting her turn to be placed in dry dock.

**Reconditioning Contract, Brooklyn, N. Y.**—The contract for reconditioning the All America Cable Company steamship Relay, bids for which were opened recently, has been awarded to the Tebo Yacht & Basin Company. Among other things, three boilers are to be installed in the ship, the prices for which were were not included in the figures submitted for hull and other work. The job amounts to $58,470.

**Contract Award, Hoboken, N. J.**—Bids for reconditioning the steamship Manchuria were opened in private at the offices of the International Marcantile Marine Company, New York City, on January 5. It was announced that the contract has been awarded to the Tietjen & Lang Yard, of the Todd Shipyards Corporation. It is believed the cost of the work will be in excess of $250,000. The principal work involved in the contract has to do with the construction and complete equipment and finish of new third-class accommodations and various other work incidental thereto.

**May Purchase Steamers, Chicago, Ill.**—It is reported that the Great Lakes Traffic Corporation is considering the purchase of ten ocean-going steamers, to be used in its Great Lakes service between Chicago, Ill., and Buffalo, N. Y.

**Repair Job, Victoria, B. C.**—Yarrows, Ltd., has been awarded the contract for repairs to the Government repair steamer Givenchy, which struck and was submerged for six weeks near Bella Bella three months ago. The work will cost about $10,000.

**Steel Hull Contract, Manitowoc, Wis.**—The Manitowoc Shipbuilding Corporation has a contract for the construction of a new steel hull for the tug J. H. Meyer. The vessel will be 99 feet over all, 22 feet beam and 12 feet 6 inches in depth. Although the present machinery will be used in the new hull, some replacements will be necessary.

**To Remodel Steamship, Vancouver, B. C.**—The Wallace Shipyards were awarded the contract for remodeling the steamer Admiral Farragut, the company being the lowest bidder at a price of $63,250. The work will require sixty days. After the Admiral Farragut is remodeled the Admiral Watson will undergo a general overhauling at the same yards.

**Steamer Repairs, Hoboken, N. J.**—The W. & A. Fletcher Company has been awarded the contract for the repair of the steamship Mount Clinton at a price of $6,000. The work includes hull and bottom damage repairs. The same yard has also been awarded the steamship Antietam, by the Shipping Board, for dry docking and overhauling of sea valves.

**Two Passenger Ships, Boston, Mass.**—It is reported that the Eastern Steamship Company, of Boston, in conjunction with the Clyde Line, of New York, is contemplating the construction of two passenger ships, which it is expected will cost close to $2,000,000 apiece. Although complete details with regard to these ships are lacking at present, it is understood they will be about 420 feet in length and oil burning.

**New Ferries, New York.**—In its requisition to the Board of Estimate and Apportionment for funds required during 1922 in order to carry out present plans, the Department of Plant and Structures of the City of New York asks $3,704,000, of which sum $1,100,000 is for the construction of new ferryboats and $550,000 for the purchase and repair of others.

**May Build Barges, Rochester, N. Y.**—The Rail and Canal Transportation Company is said to be contemplating having built eight 600-ton wooden canal barges for use on the route through the Erie Canal. As the company's trade involves long hauls, it is expected that a departure from the usual box-like design of the ordinary canal barge will be made and a shaped bow and stern adopted.

**Will Construct Lake Steamer, Port Arthur, Ont.**—The Port Arthur Shipbuilding Company has recently closed a contract for the construction of a lake steamer for the Mathews Steamship Company, which is to be ready for launching in October, 1922. The vessel is to be a steel freighter, 550 feet long. The company has placed 800 men on its pay roll to do the work on this ship, the material for which is being rushed to the head of the lakes as quickly as possible.

**Reconditioning Ship, Hoboken, N. J.**—The contract for rebuilding the engine foundations in the Hudson River steamship Hendrick Hudson has been awarded to the W. & A. Fletcher Company at a price of about $5,000.

**To Purchase Steamer, San Francisco, Cal.**—It is reported that F. M. Stark, vice-president of the Stark Steamship Lines, Inc., plans to purchase a 6,000-ton steamer for operation in the San Francisco-Portland service. Negotiations are now under way.

**Diesel Engine Contract, San Francisco, Cal.**—The Pacific Diesel Engine Company has been awarded the contract for building and installing two 525-brake horsepower Werkspoor Diesel engines in the automobile ferry now being constructed for the Golden Gate Ferry Company at the James Robertson Shipyard, Alameda, Cal.

**Engine Installation, San Francisco, Cal.**—The hull of the steamer Thomas Rolph, owned by George E. Billings, is at the China Basin plant of the Main Iron Works, undergoing engine installation. The vessel will be equipped with 1,000 horsepower triple expansion engines and will have a steaming radius of twenty days. When completed the vessel will carry about 1,400,000 feet of lumber.

**Steamers to Be Overhauled, San Francisco, Cal.**—Oliver Olson has procured the steamers Yolanda, Gabriel and the Ghislaine. The name of the Yolanda, which is the first to arrive, will be changed to Virginia Olson, and has been placed in dry dock for a general overhauling. The other two vessels will have their names changed after they have arrived at San Francisco and will receive a general overhauling as well.

**Dredge Reconditioning, Charleston, S. C.**—Among the contracts which the Charleston Dry Dock & Machine Company have in hand is the reconditioning of the United States dredge Barnard. Four Scotch marine boilers, built by the company, will be installed, and the vessel's hull and superstructure will be extensively repaired. The superheater installation, which will be by the Superheater Company, is especially interesting, it being the first instance in which superheated steam has been used on a United States dredge. The cost of the work is about $400,000.

**New Vessels for Pleasure Resort, Milford, Del.**—Burlington Island, New Jersey, is being equipped with an amusement park, fitted with the latest type of pleasure seeking devices, under the management of the Burlington Island Amusement Company, of which Captain L. H. Garrison has charge. It is expected that this will greatly increase passenger traffic to the Island, and increased facilities are being supplied by William E. Doron, who has just placed a contract for a small motor transfer boat with the William G. Abbott Shipbuilding Company for delivery in May, 1922. The Burlington Island Amusement Company is proceeding with arrangements to put in service new and faster vessels between Philadelphia and Burlington Island, which will maintain frequent service between these two points. The marine construction and rebuilding of the vessels for this service is under the supervision of Chapman & Fisher Company, Inc., 524 Walnut street, Philadelphia, Pa.

**Towing Dredge, New York.**—According to information obtained by Marine Engineering and Shipping Age, the Wah Chang Trading Corporation of China, represented in New York City by Sam Fung, is in the market for designs for a self-propelled steel, bucket, towing dredge to be worked out in America, partly fabricated in this country and erected in China. The boat is to be used as a towing barge as well as a dredge. It is understood the craft is to be 120 feet overall length, 22 feet 6 inches beam, by 8 feet deep, and is to have a compound surface condensing engine with a 13-inch high pressure cylinder, 27-inch low pressure cylinder and 16-inch stroke.



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# CONSTRUCTION FOR NAVY

Vessels under construction for United States Navy and their degree of completion as reported January 1, 1922, by the Bureau of Construction and Repair, Washington, D. C., are as follows:

| Type Number and Name | Contractor | Percent of Completion Jan. 1, 1922 |
|---|---|---|
| **BATTLESHIPS (BB)** | | |
| 45 Colorado | New York S. B. Corpn. | 86. |
| 47 Washington | New York S. B. Corpn. | 69.8 |
| 48 West Virginia | Newport News S. B. & D. D. Co. | 70. |
| 49 South Dakota | New York Navy Yard | 38. |
| 50 Indiana | New York Navy Yard | 34.3 |
| 51 Montana | Mare Island Navy Yard | 27.6 |
| 52 North Carolina | Norfolk Navy Yard | 36.7 |
| 53 Iowa | Newport News S. B. & D. D. Co. | 31.2 |
| 54 Massachusetts | Beth. S. B. Corpn. (Fore River) | 11. |
| **BATTLE CRUISERS (CC)** | | |
| 1 Lexington | Beth. S. B. Corpn. (Fore River) | 31.1 |
| 2 Constellation | Newport News S. B. & D. D. Co. | 20. |
| 3 Saratoga | New York S. B. Corpn. | 32.4 |
| 4 Ranger | Newport News S. B. & D. D. Co. | 3.8 |
| 5 Constitution | Philadelphia Navy Yard | 12.8 |
| 6 United States | Philadelphia Navy Yard | 11.8 |
| **SCOUT CRUISERS (LIGHT CRUISERS) (CL)** | | |
| 4 Omaha | Todd D. D. & Const. Corpn. | 99. |
| 5 Milwaukee | Todd D. D. & Const. Corpn. | 93.6 |
| 6 Cincinnati | Todd D. D. & Const. Corpn. | 87.6 |
| 7 Raleigh | Beth S. B. Corpn. (Fore River) | 63.7 |
| 8 Detroit | Beth. S. B. Corpn. (Fore River) | 76.9 |
| 9 Richmond | Wm. Cramp & Sons Co. | 83. |
| 10 Concord (a) | Wm. Cramp & Sons Co. | 79. |
| 11 Trenton | Wm. Cramp & Sons Co. | 55. |
| 12 Marblehead | Wm. Cramp & Sons Co. | 47. |
| 13 Memphis | Wm. Cramp & Sons Co. | 40. |
| **AUXILIARIES** | | |
| Repair Ship No. 1, Medusa (AR1) | Puget Sound Navy Yard | 74.1 |
| Dest. Tender No. 3, Dobbin (AD3) | Philadelphia Navy Yard | 66.9 |
| Dest. Tender No. 4, Whitney (AD4) | Boston Navy Yard | 47.1 |
| Sub. Tender No. 3, Holland (AS3) | Puget Sound Navy Yard | 21.5 |
| Aircraft Tender, Wright (AZ1) | Tietjen & Lang | Del. 12/16/21 |
| **PATROL VESSELS** | | |
| Gunboat No. 22, Tulsa (PG22) | Charleston Navy Yard | 71.3 |
| **DESTROYERS** | | |
| 338 Wasmuth | Mare Island Navy Yard | Com. 12/16/21 |
| 339 Trever | Mare Island Navy Yard | 98.8 |
| 340 Perry | Mare Island Navy Yard | 86. |
| 341 Decatur | Mare Island Navy Yard | 82.1 |
| (a) Light cruiser No. 10 Concord—Launched 12/15/21. | | |
| **SUBMARINES** | | |
| 115 S-10 | Portsmouth, N. H., Navy Yard | 94.9 |
| 116 S-11 | Portsmouth, N. H., Navy Yard | 92.8 |
| 117 S-12 | Portsmouth, N. H., Navy Yard | 92.5 |
| 118 S-13 | Portsmouth, N. H., Navy Yard | 90.7 |
| 123 S-18 | Electric Boat Co. (Quincy) | 97. |
| 124 S-19 | Electric Boat Co. (Quincy) | 96.5 |
| 125 S-20 | Electric Boat Co. (Quincy) | 98.5 |
| 126 S-21 | Electric Boat Co. (Quincy) | 94.9 |
| 127 S-22 | Electric Boat Co. (Quincy) | 95.8 |
| 128 S-23 | Electric Boat Co. (Quincy) | 94. |
| 129 S-24 | Electric Boat Co. (Quincy) | 93. |
| 130 S-25 | Electric Boat Co. (Quincy) | 93.5 |
| 131 S-26 | Electric Boat Co. (Quincy) | 92.4 |
| 132 S-27 | Electric Boat Co. (Quincy) | 91. |
| 133 S-28 | Electric Boat Co. (Quincy) | 91.6 |
| 134 S-29 | Electric Boat Co. (Quincy) | 90.5 |
| 136 S-31 | Electric Boat Co. (San Fran.) | 97.8 |
| 137 S-32 | Electric Boat Co. (San Fran.) | 96.9 |
| 138 S-33 | Electric Boat Co. (San Fran.) | 99.2 |
| 139 S-34 | Electric Boat Co. (San Fran.) | 95.9 |
| 140 S-35 | Electric Boat Co. (San Fran.) | 93.7 |
| 141 S-36 | Electric Boat Co. (San Fran.) | 91.7 |
| 142 S-37 | Electric Boat Co. (San Fran.) | 90.3 |
| 143 S-38 | Electric Boat Co. (San Fran.) | 84.6 |
| 144 S-39 | Electric Boat Co. (San Fran.) | 82.2 |
| 145 S-40 | Electric Boat Co. (San Fran.) | 81.2 |
| 146 S-41 | Electric Boat Co. (San Fran.) | 84.5 |
| 153 S-42 | Electric Boat Co. (Quincy) | 79.4 |
| 154 S-43 | Electric Boat Co. (Quincy) | 80.1 |
| 155 S-44 | Electric Boat Co. (Quincy) | 78. |
| 156 S-45 | Electric Boat Co. (Quincy) | 78.7 |
| 157 S-46 | Electric Boat Co. (Quincy) | 77.3 |
| 158 S-47 | Electric Boat Co. (Quincy) | 76.5 |
| 159 S-48 | Lake T. B. Co. (Bridgeport) | 98.3 |
| 160 S-49 | Lake T. B. Co. (Bridgeport) | 97.7 |
| 161 S-50 | Lake T. B. Co. (Bridgeport) | 93.8 |
| 162 S-51 | Lake T. B. Co. (Bridgeport) | 92.4 |
| **FLEET SUBMARINES** | | |
| 60 T-2 (SF 2) | Electric Boat Co. (Quincy) | 99.3 |
| 163 V-1 (SF 4) | Portsmouth, N. H., Navy Yard | 13.3 |
| 164 V-2 (SF 5) | Portsmouth, N. H., Navy Yard | 11.4 |
| 165 V-3 (SF 6) | Portsmouth, N. H., Navy Yard | 11.2 |

Note: Submarines authorized but not under construction or contract:

Fleet Submarines Nos. 166-171.

Neff Submarine (1) No. 108.

**Barge Repair, Victoria, B. C.**—The contract for repairs to the Canadian Pacific car barge, which was wrecked at Porlier Pass last month, has been awarded to the Victoria Machinery Depot at a price of approximately $50,000. The job will require several weeks for completion.

**Extensive Repair Job, Newport News, Va.**—The oil tanker F. D. Asche, recently almost a wreck off the Barbadoes, has been taken to the plant of the Newport News Shipbuilding & Dry Dock Company for repairs. The contract cost was figured at $391,000. The tanker, which was built at Newport News, will be reconditioned for the Standard Oil Company.

**Seek Passenger Vessel, China.**—It is reported that the China Mail Steamship Company has been looking for some time for a suitable passenger vessel to run in conjunction with the steamer Nile on their Hongkong, Straits Settlement and Singapore service. Although a canvass of the various ship markets of the world has been made by the company, no decision has yet been reached as to the selection of a vessel.

**Overhaul of Freighters.**—It is announced that the Shipping Board has started the overhauling of eight or ten freight steamers in order that they may be ready for sea as soon as possible, as recent inquiries received by the Board indicate that early use will be made of the vessels. The ships range from 6,000 to 9,000 tons, and are of the general cargo type.

**Munalbro Contract Award, Brooklyn, N. Y.**—Theodore Crane & Son, for a price of $3,900 and six days, has been awarded the contract for repairs to the Munson Line steamship Munalbro, which was recently damaged in a collision with the Crowell & Thurlow schooner W. F. Freeman. The steamer's starboard side and the bow were considerably damaged.

**Vessel to Be Converted Into Transport, San Francisco, Cal.**—The steamship West Lewark, a freighter which has been turned over to the army transport service of the War Department to replace the Dix, will undergo extensive alterations to fit her for transport service between the ports of Honolulu and San Francisco via Seattle. She has been placed on the dry dock of the Moore Shipbuilding Company, and while there will also be cleaned and painted.

**Burner Installation, New York City.**—The Peabody Engineering Corporation, 331 Madison avenue, has been awarded the contract for the Peabody-Fisher wide range fuel oil mechanical burners for the tank ship, now in course of construction at the yards of the New York Shipbuilding Corporation, Camden, N. J. The ship is building for the Japanese Imperial Navy, and is to be used for carrying coal as well as oil fuel for navy purposes.

**Repair Contracts, Hoboken, N. J.**—The steamship Storm King has been awarded to the W. & A. Fletcher Company for dry docking, repairs to hull damage, engines and auxiliaries and various other work. The same shipyard has also been awarded the S. V. Harkness, of the Standard Oil Company of New Jersey, for tank and machinery repairs, and the freighter Clement Smith, of the Calvert Navigation Company for repairs and reconditioning of turbines. The three contracts involve close to $10,000. The steamship Elliott, also of the Standard Oil of New Jersey, is at the Fletcher yard for dry docking and general repairs at a price of $5,700.

**To Build Motorships, New York.**—Bids for the construction of six combination cargo and passenger Diesel motorships, plans and specifications for which were issued recently by Whittlesey & Whittlesey, 17 Battery Place, New York, were opened on January 20. The ships will be 225 feet in length and will have a speed of 13 knots. These vessels are for the Tri-National Steamship Company, 17 Battery Place, and it is understood a portion of the new fleet will be used on the route between Boston and Halifax.

**Steamers Overhauling, San Pedro, Cal.**—The steamship Yale, of the Los Angeles Steamship Company, has been placed in dry dock by the Los Angeles Shipbuilding Company to undergo a complete overhauling. When the Yale resumes her run the company flagship, the Harvard, will undergo a similar overhauling.

**Lighthouse Vessels, Washington, D. C.**—According to the Commissioner of Lighthouses of the Department of Commerce, careful estimates and examinations as to the condition and further serviceability of vessels of the Lighthouse Service, it is found that sixteen light vessels and eleven tenders should be replaced within the next five years. For the construction of new lighthouse vessels, a request for $730,000 is now pending before Congress.

**Coast Guard Cutters, Washington, D. C.**—The United States Coast Guard is making plans and has asked for an appropriation for the construction of two coast guard cutters, one of 1,200 horsepower and one of 2,400 horsepower. The boats are to be propelled by Diesel electric engines, one to be equipped with four sets of 600 horsepower each, and one to be equipped with two sets of 600 horsepower each.

**Dredge, Wash., D. C.**—The War Department, it is understood, is preparing plans and specifications for a seagoing dredge 246 feet long, to be equipped with Diesel electric drive of six units of 500 horsepower each, or a total of 3,000 horsepower.

# SHIPYARDS AND DRYDOCKS

**Shipyard Incorporated, Jacksonville, Fla.**—It is announced that the Merrill-Stevens Dry Dock & Repair Company has been incorporated with a capital of $100,000 at Wilmington, Del., to acquire and operate shipyards, dry docks, etc.

**Shipyard Addition, Fairfield, Md.**—The Union Shipbuilding Company will call for bids in about a month for the construction of a two-story building 70 by 200 feet, to be erected at its plant. Revised plans for the structure are now under way. F. Stauffen is manager.

**Yard to Be Dismantled, Bristol, Pa.**—It is reported that the Shipping Board, Washington, D. C., will soon commence the dismantling of a portion of the Merchant Shipbuilding Corporation's plant at Bristol, and it is expected that cranes, crane runways and various yard equipment and other machinery will be placed on the market at an early date. The plant will, however, be operated by the Merchant corporation for some time to come.

**Dry Dock Charges Reduced, Canada.**—In order to be able to meet United States competition, the charges for the use of Canadian dry docks on the Pacific Coast have been reduced about one-third, or back to their pre-war level, for the next six months, at the end of which period the question of dry dock charges will have been considered and definitely settled by the Government. The graving dock at Esquimalt and the floating dry dock at Prince Rupert are affected by this reduction.

**Shipyard to Resume Operation, Pensacola, Fla.**—It is reported that operations at the plant of the Pensacola Shipbuilding Company will be resumed on a limited scale. At the present time there are under construction at the yard two steel barges and a snag boat, the latter to be shipped to South America. It is proposed to erect the snag boat and then take it down, mark the pieces and ship it to its destination in knockdown fashion.

# PORT IMPROVEMENTS

**Pier, Etc., Sanford, Fla.**—The Chamber of Commerce contemplates the construction of a pier and boat basin. W. T. Donnelly is the marine engineer.

**Docks, Tarpon Springs, Fla.**—Willis Castaing, Mayor, has let a contract to the J. B. McCrary Engineering Company, Atlanta, Ga., for the construction of a concrete dock at the foot of Tarpon Avenue. This work will involve the expenditure of $236,000.

**$900,000 Approved for New Pier, New York.**—The Board of Aldermen of the City of New York at its meeting on December 27, 1921, unanimously adopted the report of the Committee on Finance in favor of adopting the ordinance providing for an issue of corporate stock in the amount of $900,000, which is for the removal of present pier No. 32, North River, the construction of new pier No. 32 and dredging of the north side of pier 31, the center of slip between pier 32, as proposed, and present pier 33.

Plans and specifications for the new pier will probably be under way by the Department of Docks early in 1922. The proposed new pier will be 200 feet wide and 1,021 feet long on the north

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side, with reinforced concrete piles and foundation for a two-story shed for extra heavy loads on the roof. It is expected that the pier will be fitted with modern equipment which will be handled under a separate contract.

**River Landing, Vicksburg, Miss.**—The city will vote on $80,000 bonds, to be used for the construction of a river landing.

**Deepening Channels, Levees St. Louis, Mo.**—According to Col. Charles [illegible]tter, president of the Mississippi River Commission, the sum of $6,670,000 will be expended during the year 1922 to deepen channels and protect the levees of the Mississippi River.

**Deepening Harbor, Etc. Goderich, Canada.**—The Department of Public Works, Ottawa, Can., plans extensive harbor improvements including the deepening of the harbor at Goderich and improving and making additions to the docks. The cost of the work is estimated at $50,000.

**Transit Shed, Tacoma, Wash.**—All bids for the construction of a transit shed on the port docks were rejected by the port commission a few days ago, as they were above the $500,000 estimate made by the engineers. The drawing of new plans has been ordered, and bids will again be called for in about six weeks.

**Wharf Construction, New Orleans, La.**—It is reported that George R. Putnam, Commissioner of Lighthouses, recommends the construction of a wharf at New Orleans for the accommodation of lighthouse tenders. It is estimated that the cost of constructing and equipping the wharf will be $132,750. E[illegible]ct of Lighthouses of the New Orleans district, may be addressed concerning this project.

**Dredging, Etc., Jacksonville Fla.**—United States Engineer O'Neil is making a survey of the upper part of the Charlotte harbor with a view to extending the channel to the retaining walls of Great Bridge, and dredging a turning basin between the bridge and the railroad docks at Punta Gorda. Further information may be obtained from the Mayor.

**Dock, Hyder, Alaska.**—F. J. Williams, who operates vessels on the mail route between Ketchikan and Hyder, Alaska, contemplates the construction of a dock at Hyder. It is stated that Mr. Williams is ready to proceed with the building of the dock, if arrangements can be made for the construction of an approach to it, the approach to be 2,200 feet long and to cost $10,000. The dock will cost about $5,000.

**To Build Dock, Noble's Island, N. H.**—The Standard Oil Company of New York has made an application to the City [illegible] N. H., and the War Department, requesting permission for the construction of a large dock on property which has been controlled for many years by the Boston and Maine Railroad. The company contemplates making Portsmouth one of its big distribution points and sending its products to this port in large vessels.

**New State Pier, Portland, Me.**—Preliminary work in connection with the proposed state pier at Portland, Me., has been started. Contract for the removal of old wharves, etc., and dredging of some 150,000 cubic yards of material, involving the expenditure of approximately $70,000, has been awarded to the Aberthaw Construction Company, of Boston. It is expected the work will be completed early in April, at which time the construction of the pier itself will start.

**Will Rebuild Pier Sarasota Fla.**—The city contemplates the rebuilding of their 100-foot pier. For further information address the Mayor.

**To Rebuild Wharf San Diego, Cal.**—It is reported that the Spreckles Brothers Commercial Company, San Diego, who handle the coaling for the entire port of San Diego, contemplate the redecking and remodeling of their coal bunkering wharf, the work to involve the expenditure of about $40,000.

**Pier Construction, Portland, Maine.**—According to the latest report, it is practically settled that the Port of Portland Commission will during this year construct Pier No. 3 at Municipal Terminal No. 4, this pier to be used temporarily as an open pier without transit shed. The new pier will be 1,500 feet in length and about 240 feet wide.

**Crane Contract Award, Stapleton, S. I.**—The Wellman-Seaver-Morgan Company, Cleveland, Ohio, has been awarded the contract for supplying mechanical equipment for the new Staten Island piers 12 and 13. The contract, known as contract A, amounts to $324,500, and calls for a large number of cranes of the most modern type.

**Dredging, Jacksonville, Fla.**—John Emmille was awarded the contract for dredging the harbor of Brunswick, Ga.

**Seawall, Bay St. Louis, Miss.**—The city contemplates the construction of a seawall to cost $100,000. Further information may be obtained by addressing the Mayor.

**Pier, St. Petersburg, Fla.**—It is reported that the Atlantic Coast Line Railroad will rebuild its pier at the foot of First avenue. W. H. Willoughby, Wilmington, N. C., is chief engineer for the company.

**Dock, Canal, Etc., Hartford, Conn.**—Plans have been prepared by the Water Commissioners of Hartford, Conn., for the South Meadows project, involving the building of docks, canals, a drainage system, etc. Fay, Spofford & Thorndike, 15 Beacon street, Boston, Mass., are the engineers.

**To Improve Harbor, Louisiana.**—A survey is being conducted by the Lake Charles Association of Commerce for perfecting the Calcasieu Parish Deeper Waterway Project and creating a port for Southwest Louisiana. A Federal appropriation of $780,000 is available for this work, and Parish will supplement the Government aid by a bond issue of $1,500,000.

**Harbor Improvement, Cork, Ireland.**—The Harbor Commissioners, Cork, Ireland, reported at a meeting held a short time ago that they had decided to secure the services of the American engineer, Mr. Nicholson, who is advisory engineer to the Port of Seattle, to advise on the improvement scheme in Cork harbor, on which £1,000,000 is to be expended.

**Pier, Philadelphia, Pa.**—A contract for the construction of piers for the bridge connecting Philadelphia and Camden, N. J., has been awarded to the Keystone State Construction Company of Philadelphia, Pa., and the firm of Holbrook, Cabot & Rollins, of Boston, by the joint Delaware River Commission. The bid, made jointly by the two firms, amounted to $1,669,775. Work on these piers will probably be commenced on January 6.

## GOVERNMENT WORK

The following specifications are available at or in contemplation by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for various work on material as listed below:

**Power Plant Equipment, Bellevue, D. C.**—Bids are being received for 150 horse-power return tubular boilers and mechanical stokers, boiler and fire pumps, motor-driven air compressor or brick setting and superheaters for four boilers, crane, two turbine-driven forced draft fans, air condenser and circulating pumps, pipes, etc., to be furnished and installed. Specification 4497.

**Reservoirs and Dispensary, Yorktown, Va.**—Construction at mine depot planned. Specification 4565.

**Storage Buildings, Pearl Harbor, T. H.**—Mine storage building at the ammunition depot planned. Specification 4567; and five buildings for torpedo and ammunition storage at the same depot; Specification 4566.

**Motor Generator Set, Hampton Roads, Va.**—Installation of motor generator set and switchboard at the naval operating base planned. Specification 4570.

**Steam Piping System, Yorktown, Va.**—Installation planned. Specification 4573.

**Operating and Power Building, Etc., Tatoosh, Wash.** Operating and power building with accessories at the naval radio station contemplated. Specification 4574.

**Dredging, Norfolk, Va.**—A contract for dredging 200,000 cubic feet in order to deepen the waterfront of the Navy Yard at Norfolk has been let to the Jones Dredging Company, Norfolk.

**Storehouse, Pearl Harbor, T. H.**—Specification 4504. The Bureau of Yards and Docks, Navy Department, Washington, D. C., has awarded a contract to W. F. Martens, 53 Franklin Street, Rochester, N. Y., for the construction of a one-story storehouse, the price being $196,775. Two hundred and sixty-three days will be required for the completion of the work.

**Dredging, Los Angeles, Cal.**—The District Engineer has awarded a contract to the United Dredging Company, Central Building, for dredging in Los Angeles harbor, the work to cost $37,340.

**Dredging Plant, San Diego, Cal.**—The United States Engineer has awarded a contract to the Olympian Dredging Company, 249 First avenue, San Francisco, Cal., for the hire and operation of a dredging plant at a price of $125,000.

## NEW INCORPORATIONS

The Empire Steamship Company, Manhattan, has been incorporated, with a capital of $50,000, by F. Leftwich, J. L. Smith and L. Dunkelman. F. Weinstein, 165 Broadway, New York, is attorney.

The Commercial Pilot Steamship Company, Ltd., has been incorporated in Wilmington, Del., with a capital of $100,000, to build, own and operate boats.

The Inter-Coastal Steamship Company has been incorporated in Dover, Del., with a capital of $1,000,000, to engage in ocean commerce.

The Arconstruct-Hullfin Engineering Company has been incorporated with a capital of $100,000 under the laws of Delaware to carry on the business of naval architecture and marine engineering, operating under exclusive Arconstruct-Hullfin combination patent rights held by C. V. S. Wyckoff, naval architect and consulting engineer. The officers of the new company are as follows: C. V. S. Wyckoff, president; F. F. Boyd, vice-president; Frank Nichols, vice-president; Morgan Olcott, secretary, and Robert B. Palmer, Jr., treasurer.

The Terminal Iron Works Co. has been organized by Harry W. Fawke, of San Francisco, former superintendent of hull construction at the Moore Shipbuilding plant, and Edward McKurley, of Stockton, who have acquired the plant and property of the Stockton Iron Works for the manufacture of steel and iron products. The company is considering the establishment of a branch plant for ship repair work, to be operated in conjunction with their structural department.

## FOREIGN ACTIVITIES

**New Port, Rocky Point, Mex.**—A new port terminal is being constructed by the Tucson, Gila Bend and New Cornelia Railroad at Rocky Point on St. George's Bay, Gulf of California, on the mainland about 100 miles north of Guaymas. The company proposes in this way to provide an outlet for the products of the Arizona copper mines.

**Provisional Wharf.**—The Mexican Government is reported to have approved plans and considerable materials have been ordered for the construction of a provisional wharf at Manzanillo. The new wharf will be about 450 feet long and 45 feet wide, with a draft alongside of not less than 30 feet.

**Wharf Construction.**—It is announced from Guayaquil that the recent Congress of Ecuador has authorized the letting of contracts for the construction of a wharf and custom house at Guayaquil in connection with other projects. Funds for the port construction are to be provided in part, either at public auction of Government owned land in Guayaquil or by loans secured by these lands.

**New Harbor, Gisborne.**—The Marine Department of New Zealand Government has approved and adopted the plans prepared for the proposed harbor at Gisborne.

**Site for Port, Komarno, Poland.**—The Czecho-Slovak Government has acquired a site at a price of half a million kroner at the town of Komarno on the Danube for the purpose of establishing a port.

**Shipbuilding, Germany.**—According to the American Bureau of Shipping, German shipyards turned out about 400,000 gross tons of ships in 1921. One hundred steel ships, ranging in size from 1,500 to 10,000 tons, are included in this figure. Of these 100 vessels six were motorships aggregating 30,284 gross tons. German shipbuilding now ranks second to that of Great Britain.

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## BUSINESS NOTES

William Homes Davis, president of the Virginia Forwarding Corporation is the new president of the Hampton Roads Foreign Trade Club.

B. C. Colonna, of the Colonna Marine Railway Corporation, is the new president of the Norfolk Ironmasters' Association, an organization of ship repair plants.

The Bird-Archer Company has moved its New York office from 90 West street to 33 Rector street.

Messrs. Rossell and Thayer, naval architects and marine engineers, Forrest Building, Philadelphia, Pa., have been made the sales engineers and exclusive agents of the Superior Iron Works Company of Superior, Wis., for the territory from Portland, Maine, to Norfolk, Va. They handle steam and electric deck machinery and steering gears and special dredging machinery, as well as a patented steam scow winding gear.

The twenty-fifth annual meeting of the American Society for Testing Materials will be held on June 26-July 1, 1922, at Atlantic City, N. J., with headquarters at Chalfonte-Haddon Hall Hotel.

O. M. Rau, formerly consulting engineer to the Philadelphia Rapid Transit Company, has become associated with the Hardinge Company, Inc., 120 Broadway, New York, and will specialize in the handling of Quigley Pulverized Fuel Systems as applied to boilers. W. O. Rankin has also become associated with the Hardinge Company, in the capacity of managing engineer of the Quigley Pulverized Fuel Department. These changes have taken place with the acquirement by the Hardinge Company, Inc., of the Pulverized Fuel Department of the Quigley Furnace Specialties Company.

William Thompson, district manager for the Texas Company has been elected president of the Hampton Roads Maritime Exchange for the year 1922.

The Pneumercator Company, Inc., announces the removal of its factory from Philadelphia, Pa., to the Sperry Building, 40 Flatbush Avenue Extension, Brooklyn, N. Y., on February 1. Its general offices at 15 Park Row, New York, will be located at the new factory after February 1.

George W. Green has resigned as assistant general manager of the Los Angeles Steamship Company, San Francisco, Cal., to become general assistant to A. J. Frey. He formerly was Mr. Frey's assistant in the Pacific Mail construction division of the Shipping Board and Los Angeles Steamship Company.

## TRADE PUBLICATIONS

SOOT BLOWERS IN MARINE BOILERS.—The Diamond Power Specialty Company, Detroit, Mich., has recently published an enlarged and revised edition of bulletin 134, "How Some Ship Owners Have Increased their Profits." This book deals with soot losses in coal and oil fired boilers, with a special section devoted to the latter type. In addition, the bulletin describes and illustrates in detail the automatic rear end front operated soot blower for double and single ended Scotch boilers, the front end oscillating type, the revolving type for water-tube boilers, the Diamond system for hollow staybolts in horizontal baffled water-tube boilers. This bulletin may be obtained from the Detroit or New York offices of the company.

CENTRIFUGAL PUMPS.—An instruction book dealing with the construction and installation of centrifugal pumps of the VH type, class B, BS and OS has been issued by the Worthington Pump & Machinery Corporation, N. Y. Actually this might be termed a hand book on centrifugal pumps for the use of operating engineers. Complete details for the erection of pumps are given in the first part of the book, followed by curves showing the maximum water temperature allowable for different suction lifts. Farther along curves are given of the head capacity and efficiency capacity characteristics of the centrifugal pump. The various types of pumps are described in detail and many useful tables of data given. Readers may obtain copies of the book from the company by asking for bulletin No. 605-L.

MACHINE TOOLS.—The "Triplex" No. 1 machine tool designed for turning and boring, milling, thread cutting and drilling is described in detail and its application to each of these operations in a pamphlet sent out by the Triplex Machine Tool Corporation, New York. The advantage of this machine is that it combines a number of machine tools in one, cutting down equipment investment and saving floor space. A price list is included in the pamphlet.

"BRIDGING TWO OCEANS AND LINKING FOUR CONTINENTS" is the title of a booklet, recently issued by the Canadian Pacific Railway, which contains descriptions of the company's steamship services and various facilities offered. It tells of the company's ocean tonnage of 800 growing into over 465,000 tons, and the one service into numerous ones by which Canada is now linked with four continents. Illustrations and descriptions of the more pretentious vessels, including the *Empress of Canada*, a vessel of 22,500 tons, *Empress of Australia*, etc., are given, as well as illustrations of the various ports in all countries of the world which are linked by the Canadian Pacific services. Special mention is made of their oil-burning vessels and their particular advantages.

"OLD IRONSIDES"—A decorative calendar carrying a history and reproduction of a painting of the famous frigate *Constitution* is being distributed by the Columbian Rope Company, Auburn, N. Y. A bulletin describing the complete process of the manufacture of Columbian pure manila, tape marked rope is also available. The company will be pleased to send these on request.

## MARINE SOCIETIES

### AMERICA

**AMERICAN SOCIETY OF NAVAL ENGINEERS**
Navy Department, Washington, D. C.
President—Capt. A. J. Hepburn, U. S. N.
Secretary-Treasurer—Commander J. S. Evans, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.
Annual meeting and election, first Tuesday in October, other meetings at call of the President.

**SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS**
29 West 39th Street, New York.
President—Walter M. McFarland.
Secretary and Treasurer—Daniel H. Cox.

**NATIONAL ASSOCIATION OF ENGINE AND BOAT MANUFACTURERS**
29 West 39th Street, New York City.

**UNITED STATES NAVAL INSTITUTE**
Naval Academy, Annapolis, Md.
President—Rear Admiral Bradley A. Fiske, U. S. N.
Secretary and Treasurer—Commander H. K. Hewitt, U. S. N.

**NATIONAL ASSOCIATION OF MASTERS, MATES AND PILOTS**
National President—John H. Pruett, 423 Forty-ninth St., Brooklyn, N. Y.
National Treasurer—A. B. Devlin, 187 Randolph Ave., Jersey City, N. J.
National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

**LIST OF OFFICERS, AMERICAN SOCIETY OF MARINE DESIGNERS**
President—E. H. Monroe, Washington, D. C.
Vice-President—C. C. Jacobson, New York City.
Secretary—B. G. Barnes, 47 Saville Avenue, Quincy, Mass.
Treasurer—J. B. Sadler, Norfolk, Va.
Executive Committeemen—John Thomson, Bethlehem, Pa.; A. H. Haag, Baltimore, Md.; C. D. Anderson, Washington, D. C.

**NATIONAL MARINE ENGINEERS' BENEFICIAL ASSOCIATION**
Headquarters 311-315 Machinists Building, Washington, D. C.
President—Wm. S. Brown.
Secretary-Treasurer—George A. Grubb.

**ATLANTIC COAST SHIPBUILDERS' ASSOCIATION**
1701 Walnut Street, Philadelphia, Pa.
Secretary—C. S. King.

**AMERICAN STEAMSHIP OWNERS' ASSOCIATION**
11 Broadway, New York
Vice-President and General Manager—Winthrop L. Marvin.

**UNITED STATES SHIP OPERATORS' ASSOCIATION**
149 Broadway, New York
President—C. H. Potter

### CANADA

**GRAND COUNCIL, N. A. OF M. E. OF CANADA**
Grand President—E. Read, Rooms 10-12, Jones Building, Vancouver, B. C.
Grand Vice-President—Jeffrey Roe, Levis, P. Q.
Grand Secretary-Treasurer—Neil J. Morrison, Box 886, St. John, N. B.
Grand Conductor—E. A. House, Box 333, Midland, Ont.
Grand Door Keeper—Lemuel Winchester, 306 Fitzroy Street, Charlottetown, P. E. I.

### GREAT BRITAIN

**INSTITUTION OF NAVAL ARCHITECTS**
5 Adelphi Terrace, London, W. C.

**INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND**
39 Elmbank Crescent, Glasgow.

**NORTHEAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS**
Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

**INSTITUTE OF MARINE ENGINEERS, INCORPORATED**
The Minories, Tower Hill, London.

### ITALY

**COLLEGIO DEGLI INGEGNERI NAVAL E MECCANICI IN ITALIA.**
Via Carlo Alberto 18, Genova.

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